HELSINKI SCHOOL OF ECONOMICS (HSE)
Department of Accounting and Finance

TAKEOVERS OF ELECTRICITY UTILITIES IN FINLAND – TRANSFER OF OWNERSHIP FROM MUNICIPALITIES TO PRIVATE COMPANIES

Finance
Master´s thesis
Antti Honka
Spring 2008

Approved by the Council of the Department 13/5 2008 and awarded the grade excellent, 90 p.

Tarkastajat:
KTT, Vesa Puttonen
KTT, Matti Keloharju

Helsinki School of Economics
Master's Thesis
Antti Honka

Abstract
May 5, 2008

TAKEOVERS OF ELECTRICITY UTILITIES IN FINLAND – TRANSFER OF OWNERSHIP FROM MUNICIPALITIES TO PRIVATE COMPANIES

PURPOSE OF THE STUDY

The purpose of this Thesis is to study effects of an electricity utility merger on the target company's distribution pricing and on economy of the target's municipal owners. The mergers are studied under a conceptual framework developed on the basis of previous research. The ownership effect in pricing and the implications of share sale are measured with a model that simulates acquisition targets' business under municipal ownership and compares it to the realized situation.

The study discusses arguments regarding drastic post-takeover price increases and extends knowledge on European electricity utility mergers. The Thesis provides alternative viewpoints for municipalities contemplating a merger with a privately owned utility.

DATA

The data in this study mainly comprises of electricity pricing and financial data of ten case utilities and electricity consumption data of 73 municipalities. In addition, sector specific parameters and information on benchmark companies are included in the empirical model. The actual pricing and consumption data covers a time period of 1998-2007.

RESULTS

The first main finding of this Thesis is that electricity distribution prices rise in connection with change of ownership from municipal to private. However, price increases are not substantial when assessing them against price development of selected benchmarks. The results provide support for the findings of previous research. The second significant finding is that the proceeds from the share sales have been sufficient considering the utilities former contributions, low prices and/or dividends, to the municipal owners.

The results suggest that the bidders have had also other incentives to pursue acquisitions than mere possibility to increase prices. The mergers may have been motivated by post-acquisition cost-cutting, electricity supply price increase and a possibility to acquire a significant market player.

Measuring the utilities' contributions to the owners includes uncertain elements, but the results are otherwise meaningful. The municipalities may assess their shareholding in their local utility in the light of this Thesis' results. Furthermore, this study deepens knowledge of implications of electricity utility mergers and the factors leading to their success.

KEYWORDS

Electricity utility, takeover, electricity distribution, pricing policy, municipal ownership

Helsingin kauppakorkeakoulu
Pro Gradu -tutkielma
Antti Honka

Tiivistelmä
5.5.2008

SÄHKÖYHTIÖIDEN FUUSIOT SUOMESSA – OMISTUKSEN SIIRTYMINEN KUNNILTA YKSITYISILLE YHTIÖILLE

TUTKIMUKSEN TARKOITUS

Tutkielman tarkoituksena on tutkia sähköyhtiöfuusion vaikutuksia kohdeyhtiön sähkönsiirron hinnoitteluun ja sen entisen kuntaomistajan talouteen. Aikaisemman tutkimuksen perusteella luodaan viitekehys, jonka kautta fuusioita tarkastellaan. Omistajuuden vaikutusta hinnoitteluun ja osakemyynnin seurauksia arvioidaan mallilla, joka simuloi kohdeyhtiöiden toimintaa kunnallisessa omistuksessa ja vertaa sitä toteutuneeseen tilanteeseen.

Tutkielma arvioi julkisessa keskustelussa esitettyjä argumentteja fuusion jälkeisistä voimakkaista hinnannostoista. Tutkimus syventää tietämystä eurooppalaisista sähköyhtiöfuusioista ja tarjoaa vaihtoehtoisia näkökulmia kunnille, jotka harkitsevat paikallisen sähköyhtiönsä myymistä yksityiselle toimijalle.

AINEISTO

Tutkimuksen aineisto koostuu pääosin sähkönhintatilastoista ja taloudellisesta informaatiosta koskien kymmentä yhtiötä sekä 73 kunnan sähkönkulutustiedoista. Tämän lisäksi aineistoa toimialasta ja vertailuyhtiöistä käytetään hyväksi empiirisessä mallinnuksessa. Hinta- ja kulutustilastot kattavat vuodet 1998–2007.

TULOKSET

Empiiristen tulosten mukaan sähkön siirtohinta nousee, kun yhtiön omistajuus vaihtuu fuusion yhteydessä kunnallisesta yksityiseksi. Hinnannousu on kuitenkin suhteellisen pieni verrattuna vastaavien kunnallisten yhtiöiden hintakehitykseen. Tulokset tukevat aikaisempien tutkimusten löydöksiä. Toinen merkittävä tulos on se, että yhtiön osakkeista saatu myyntitulo on ollut riittävä korvaamaan hintaetu ja osingot, joilla sähköyhtiö on tukenut kunnan taloutta ja yhteisöä.

Tulosten perusteella voidaan todeta, että fuusion takana on ollut myös muita motiiveja hinnoittelun muuttamisen lisäksi. Kustannusten leikkaaminen, myyntikatteen korottaminen sähkönmyynnissä ja mahdollisuus ostaa merkittävä markkinatoimija ovat olleet mahdollisia syitä fuusioille.

Sähköyhtiön kunnalle jakaman taloudellisen hyödyn mittaamiseen liittyy epävarmuuksia, mutta tutkimuksen tulokset ovat muilta osin merkittäviä. Kunnat voivat arvioida tämän tutkielman perusteella osakeomistuksensa hyötyjä ja haittoja. Lisäksi tutkielma laajensi tietämystä sähköyhtiöiden fuusioiden vaikutuksista ja tekijöistä, jotka vaikuttavat niiden onnistumiseen.

AVAINSANAT

Sähköyhtiö, fuusio, sähkönsiirto, hinnoittelu, kunnallinen omistus

Table of contents

List of figures

List of tables

Glossary of Terms

DEA	Data envelope analysis
EdF	Electricite de France
EMA	Electricity Market Authority
GWh	Gigawatt hour
IVO	Imatran Voima Oy
KSV	Keski-Suomen Valo Oy
LOSU	Lounais-Suomen Sähkö Oy
kV	Kilovolt
MW	Megawatt
OFC	Office of Free Competition
PV	Present value
PVO	Pohjolan Voima
Std	Standard deviation
TWh	Terawatt hour
WACC	Weighted average cost of capital

Part I - Overview

1 Introduction

Energy production, transmission and distribution assets are seen very valuable now that there is uncertainty related to energy prices and moreover, rising trend in energy costs. Not long ago, governments held most of the energy generation, distribution and supply under their ownership and kept the price level stable and predictable for end users. The situation has changed since liberalisation of energy markets that began in the 1960s in the US and continued in Europe in the 1990s. Energy market was officially opened in Finland in 1995.

Privatization of state-owned utilities and market opening has introduced competition to energy markets, especially regarding electricity, and on the other hand regulation of energy supply operations that have monopoly characteristics. In Finland electricity sales business is under competition whereas electricity distribution is regulated. Upon the liberalisation, electricity utilities face new business risks; the electricity wholesale price fluctuation and regulatory risk in the distribution business. While the risk of adverse change in regulatory framework is rather diminutive, not all municipally owned utilities are willing to bear the risk in electricity supply and generation.

The sector has experienced consolidation to some extent and many of the existing municipally owned Finnish electricity utilities are contemplating a merger with a large private enterprise. The latest acquisition of a large municipal company occurred in 2002, when Graninge (now E.ON) acquired the majority of Kainuun Sähkö Oy. In 2008, there has been discussion on sale of the energy utility of the city of Lahti, Lahti Energia Oy, and on merger between Suur-Savon Sähkö Oy and Etelä-Savon Energia Oy with German E.ON as a minority shareholder. In every case, ratepayers have been concerned about post-merger price increases. Traditionally, municipality owned utilities have subsidized the community with low, in other words non-profit-maximizing, electricity prices (Hollas et al., 1994; EMA, 2008a).

Freshened takeover activity in the sector and the associated public discussion gives an incentive to study the arguments on price increases and the effect of share sale on a municipality's economy. According to previous studies (Averch & Johnson, 1962; Hollas et al., 1994; Domah & Pollitt, 2001), utility pricing policy is expected to change when switching ownership from public to private. On the other hand, the selling municipalities could earn

additional income with rational investing of the cash payment. For example, the total value of the six deals made by Vattenfall alone in 1995-2000 has been about €650 million and concerned some 60 municipalities.

Another incentive to conduct a study on Finnish electricity utility takeovers is the lack of literature from this field. Research on mergers of European energy utilities has been scarce. Descriptive studies on European mergers and acquisitions have been made by Hendrickson (2003) and Codognet et al. (2003). Other recent studies concerning the sector have been made on privatization (see e.g. Domah & Pollitt, 2001) and operating efficiency in distribution (Kinnunen, 2005).

The conclusions reached in this study are important for several reasons. First, the results may deepen the discussion on post-acquisition pricing. Second, owners of electricity utilities may assess a possible offer on their utility from an alternative point of view. Thirdly, the study expands knowledge of the incentives and factors leading to electricity utility mergers. Finally, this Thesis tries to answers the question why the consolidation of the electricity utilities has ceased in Finland in the 21st century.

1.1 Scope of Study

Discussion on the pricing policies of large electric and energy utilities and on the supplier power that they have in their territory gives an incentive to conduct a study on takeovers of municipality owned electricity companies. This Thesis studies mergers of Finnish electric utilities in 1995-2007. The focus of the study is on implications of the mergers and rationale behind them, mostly from the electricity distribution business' perspective. Distribution has been by far the most valuable business of the Finnish electricity utilities and distribution pricing is controlled by the regional utility within the limits of regulation. The mergers are studied by observing a particular takeover processes, following electricity distribution prices and the takeovers' financial implications. The research questions are:

> *Has the price of electricity distribution increased due to change of ownership from municipal to private?*
>
> *Were the proceeds from selling the utility shares an adequate compensation for a municipality for losing control of electricity pricing in its area?*

Did the acquiring companies have other incentives for a merger than a possibility to increase prices?

Why the studied electricity utilities in particular have been targets of takeovers?

To answer the questions a conceptual framework is developed based on previous research. The framework involves the electricity utilities sector's characteristics and motivations of the bidder and the target for an electricity utility merger. Based on the framework, empirical part of the Thesis tests three hypotheses and provides background for broadening discussion on Finnish electricity utility mergers.

Overview of previous research begins with description of the market conditions at the time of the takeovers in Section 2. The dominating element in the sector is the regulatory framework which sets the limits for the distribution activities. Section 3 reviews studies in the field of electricity utility mergers, operational efficiency in distribution and the effect of ownership on a utility firms' course of business. Section 4 examines municipalities' preference for low utility prices versus revenue collection from the companies under their ownership. Section 5 summarizes the Literature review and formulates hypothesis on the expected outcomes of the takeovers. Hypotheses are then tested in the empirical part of the study.

Empirical part begins with description of the methodology used in the calculation model in Section 6 and continues with introduction of the takeover sample, the bidders, targets and peer group companies in Section 7. A model is developed to assess the change in a municipality's wealth after selling its stake in a regional electricity utility. Due to limited number of takeovers in the sample period, the empirical part is more or less a case study. It evaluates the financial gains and losses of outsourcing the local electricity distribution, mainly from the municipalities' point of view. The main elements in the analysis are selling price of the shares, post-takeover electricity distribution price and profit distribution.

The results of the empirical analysis are presented and discussed in Section 8. First the results on post-acquisition pricing are revealed and then the effects of the mergers on a municipality's wealth are discussed. The robustness of the results is examined with sensitivity analysis. Finally, the significance of post-acquisition distribution pricing in the takeover process is assessed against other important factors for bidders and targets: ability to cut cost and increase retail supply price. The organization of ownership of the targets is also discussed in this context. Section 9 concludes the study.

The focus is only on Finnish electricity distribution since the business' development and pricing can be analyzed to a reasonable extent. First, the pricing of distribution is not affected by external factors such as competition, customers' choice or supplier power and thus the price level can be decided by the distributor within the limits of reasonable return. Second, there is public information on the electricity prices after 1998. Finally, other outputs of utilities are exposed to competition (electricity retail sales) or do not have transparent pricing mechanisms (district heating).

1.2 Definitions

This Thesis describes and analyses takeover targets' features in connection with ownership form and nature of the business. All the studied companies were municipal enterprises or more specifically municipal co-operatives. The former type of an enterprise is owned completely by a municipality and the latter by group of municipalities. Rose and Joskow (1990) use definition co-operative when referring to regional rural electric companies. The co-operatives may also have minor owners representing investors other than the local administration.

When changing ownership of a state-owned enterprise to private hands, the process itself is just changing of managerial technique. Savas (2000) explains the numerous definitions of word "privatization" and its uses. Usually it means transfer of ownership - in whole or in part - from the state to private hands. Municipal co-operatives are more or less privatized already, since they are independent from any centralized state governance. Traditionally, municipalities or cities have been responsible for providing the necessary utilities for the community.

Finnish energy utilities usually supply heat, electricity and gas where available for the consumers. Electricity utilities' main business is, on the other hand, supply of only electricity. Supply of electricity consists of two separable functions: electricity retail sales and distribution. Electricity transmission, electricity supply through high voltage networks (over 110 kV in Finland), is pursued solely by national grid operator Fingrid Oyj. Electricity distribution and gas sales are regulated by law, whereas provision of district heat and electricity sales are unregulated businesses.

Regulation is set to control prices of a business considered as natural monopoly. If well-designed, the regulation scheme provides the license holder compensation for all relevant

costs plus and a fair return for invested capital. If the rate of return, computed as the ratio of net revenue to the value of the plant and equipment (the rate base), is judged to be excessive, pressure is brought to bear on the firm to reduce prices. If the rate is considered too low, the firm is permitted to increase prices.

Part II - Literature review

2 Electricity sector in Finland

Three factors are characteristic of electricity sector in Finland. First, the electricity distribution is heavily regulated as in most liberalised energy markets. The level of reasonable return sets a cap for the allowed revenue derived from distribution operations. Second, the distribution prices have been on a fairly low level in comparison with other European countries. Third, the sector is very fragmented as over 90 electricity utilities operate in the sector that is proven to have economies of scale, at least in small volumes.

The development and liberalisation of the sector in Finland has proceeded progressively without any radical transformations such as the break down of the main utility in the UK. Domah and Pollitt (2001) report 15 per cent immediate rise in real distribution and supply cost after privatization in England and Wales in 1990. Not until 1995 the costs started to decline heavily while the regulatory body tightened the regulation. Newbery and Pollitt (1997) find regulatory failure behind the rise in prices and profits after privatisation. One of the key findings in research on regulatory economics has been the switch in allocation of resources in post-privatization regulation.

Government regulatory agencies commonly employ a "fair rate of return" criterion: After the firm subtracts its operating expenses from gross revenues, the remaining net revenue should be just sufficient to compensate the firm for its investment in plant and equipment. Under a cost regulatory scheme, the firms may change their behaviour into "target pricing" that is not too high or low from taxation point of view (Averch & Johnson, 1962). Substituting between factors, labour and capital may also occur. The shift occurs because rate-of-return regulation makes cost minimization suboptimal for profit-maximising investor-owned utilities while municipality owned utilities are not similarly constrained (Neuberg, 1977).

This section develops a market framework for takeovers of Finnish electricity utilities. Keeping in mind the basic theories of regulation and implications of public to private ownership changes, the key features of the Finnish market are discussed. Previous research on the subject is limited and especially deregulation experiences of smaller nations like Finland are poorly documented. This part starts from the background and development of the market

in Section 2.1 and proceeds to description of the business model of the distribution companies in Section 2.2.

2.1 Development of Finnish electricity market

Similarly to most countries, the state in Finland has dominated infrastructure industries such as electricity transmission and generation, telecommunications and railways (Willner, 2003). The feature that has been distinguishing Finnish electricity market from those of other countries was the high degree of liberalisation at early stages (Pineau & Hämäläinen, 2000). Even with a state-owned company Imatran Voima (IVO), now Fortum, that dominates electricity generation, other smaller utilities had been important already before the market opening.

Industrial companies and distributors were allowed to produce and sell electricity limiting the monopoly power of IVO. Wholesale market was in theory open, but in practise dominated by IVO and limited by long-term contracts (Pineau & Hämäläinen, 2000). As early as 1989, no construction permit was needed for power plants of capacity less than 250 MW, excluding nuclear power, hydro power and foreign trades of electricity. Very uncommon compared to the worldwide situation was, at that time, the presence of competition in the transmission network.

Two companies, IVO and Pohjolan Voima (PVO) owned and operated the most of the transmission lines and offered limited access to them. PVO's network was for generators who wanted to avoid the use of IVO's network and was also limited in length (SENER, 2000). About 100 distribution companies owned mainly by municipalities were operating in their local territory. All electricity spot transactions were subordinate to the long-term contracts so that they took place only if there was no conflict with them. The level of fees was fixed such that the forecast average cost plus an adequate profit was realized by IVO.

Some limits on the fees were introduced due to fear of someone entering in transmission. Construction of new lines was open to anyone and IVO had the obligation in such case to link them with the existing network. IVO was the main user of its own grid but was not applying its transmission pricing scheme for its production. The economic signals related to transmission pricing were not apparent in the price of energy sold.

The energy market reform changed the situation in the transmission and distribution. At the end 1996, IVO and PVO merged their transmission activities to Finnish Power Grid PLC, later changed to Fingrid (SENER, 2000). The distribution pricing became more explicitly regulated. From 1988 to 1995, the Office of Free Competition (OFC) monitored their pricing, on a "reasonable profitability" basis. The OFC's role in general was only to react to complaints and to monitor "free competition".

Only one organization acted as a regulator before the Electricity Market Act, the Ministry of Trade and Industry (Ministry of Employment and the Economy after 1 January 2008). The monitoring of the Ministry was mainly reactive and relied on cooperation of the players. Indeed, no explicit and detailed rules to follow were written. The following points can summarize the Ministry's main tasks in the electricity sector (OECD, 1997):

1) delivering licenses for nuclear production
2) delivering licenses for transmission lines of at least 110 kV
3) giving judgement in case of complaint on transmission prices in the three networks and abuse of monopoly power in distribution
4) monitoring inputs

2.1.1 Reform and regulator's role

Adopted during the summer of 1995, the Electricity Market Act had certain objectives related to national and international electricity markets. It promoted increase of efficiency and competition in generation and transmission in order to open Finnish electricity market to international competition (mainly from other Nordic countries). Conformity with the EU policy energy directives was also a factor (Pineau & Hämäläinen, 2000). According to their principles, distribution companies are obliged to serve all buyers of networks services on equal and equitable terms (OECD, 1997). The market opening is based on the so-called regulated third party access, which means that customers are allowed to buy their electricity from the supplier of their choice (Kinnunen, 2005). The opening of the market proceeded as follows (Sähkömarkkinakeskus, 2000):

1) The Electricity Market Act came into force and The Electricity Market Authority was set up – 1995
2) Gradual opening of network - 1995
3) The Finnish Electricity Exchange EL-EX started operation - 1995
4) Unbundling of tariffs - 1996
5) Creation of Fingrid – 1997
6) Complete opening of the market – 1997

7) Small-scale customers were brought within the scope of competition without the obligation to use hourly metering – 1998

The Energy Market Authority is an expert body subordinate to the Ministry of Trade and Industry. Its operation started as the Electricity Market Authority on 1 June 1995, at the same time the Electricity Market Act took effect, opening stepwise the electricity market to competition (EMA, 2008b). The mission of the Energy Market Authority is to supervise and to promote functioning of the electricity and natural gas markets and to establish preconditions for the emission trade (EMA, 2008b). Electrical power networks form a market place which serves the electricity market parties, both sellers and buyers, on reasonable and equitable terms.

As far as electricity distribution is concerned Energy Market Authority monitors that the pricing of network services produced by distribution and regional network operators and national grid is reasonable and non-discriminatory. The prices of network services, such as connection to the network, and distribution and metering of electrical energy, must be made public, and reasonableness and regional impartiality must be followed in their pricing. The customer must be able to agree on all the network services he needs with the company to whose network he has been connected. Supporting these objectives, the Energy Market Authority produces and publishes real-time information on the pricing of both electric energy and its distribution.

2.1.2 Electricity price

The Energy Market reform made pricing of certain operations explicit and public. According to EMA (2008b), the prices of network services (connection to the network, transmission, distribution and metering) shall be in the public domain, and the prices shall be reasonable and regionally equitable. Due to published pricing data, which is harmonized to match certain consumer types' consumption pattern, price development can be extracted.

The total consumer's electricity bill comprises of energy fee and distribution fee. Historically, the bill has been split roughly half between the two components. The competitive part, energy fee, has driven the prices for the last ten years. From the level of 1997, the total electricity bill of a household consumer living in a flat has increased by 25-40%. In the end of 2007, electricity cost for the same consumer type was 12.56 c/kWh. Figure 1 plots the electricity price development for selected consumer types.

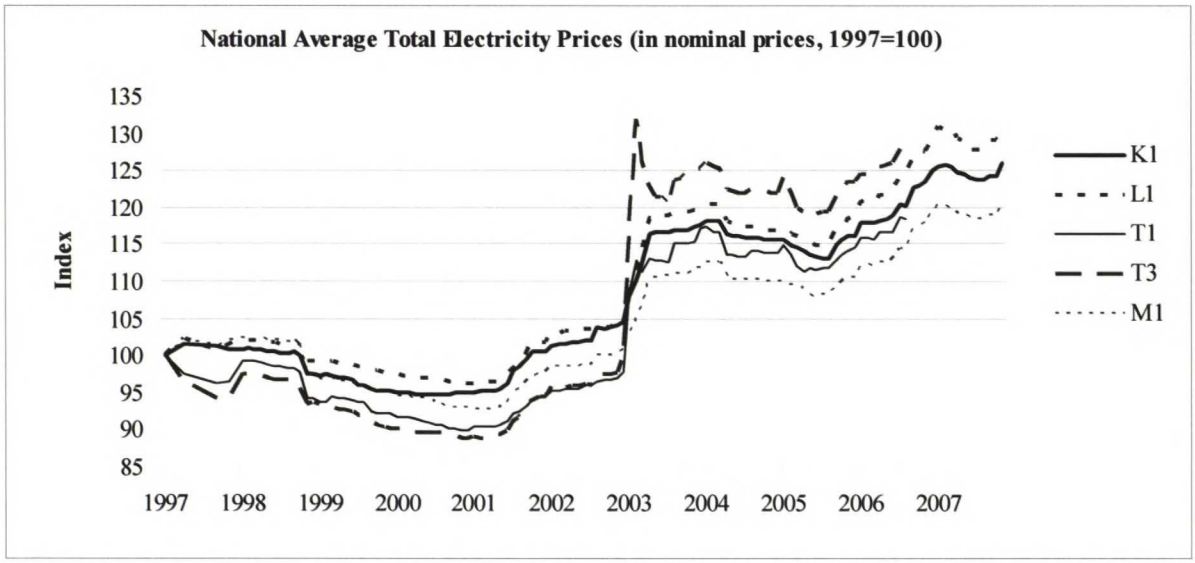


Figure 1. Development of total average price of electrical energy in Finland in 1997-2007 (EMA, 2008c)

As for various types of consumers the average prices have been weighted by the quantities of electricity used by the customer groups according to the Electricity Statistics for Finland 1995. Types of consumer:

K1=Flat, fuse 1x25 A, consumption 2 000 kWh/year
L1=Single house with direct electric heating, fuse 3x25 A, consumption 18 000 kWh/year
T1=Small-scale industry, consumption 150 000 kWh/year, demand 75 kW
T3=Medium-scale industry, consumption 2 000 000 kWh/year, demand 500 kW
M1=Agriculture, fuse 3x35 A, consumption 10 000 kWh/year

The development of distribution network prices in Finland shows no increase in real terms to all types of customers after liberalization of the electricity market. Price started to fall soon after the first regulatory decision in February 1999 (Sähkömarkkinakeskus, 2000). The decreasing trend was re-enforced by a 7% reduction in national network prices in 2000-2001. The sole explanation for the sudden rise in prices in May 2001 is the increase in the prices of one of the largest firms in the sector, Fortum (Kinnunen, 2005). In the end of 2007, electricity distribution cost 5.99 c/kWh to a consumer living in a flat. Figure 2 shows the indexed distribution prices in 1997-2007.

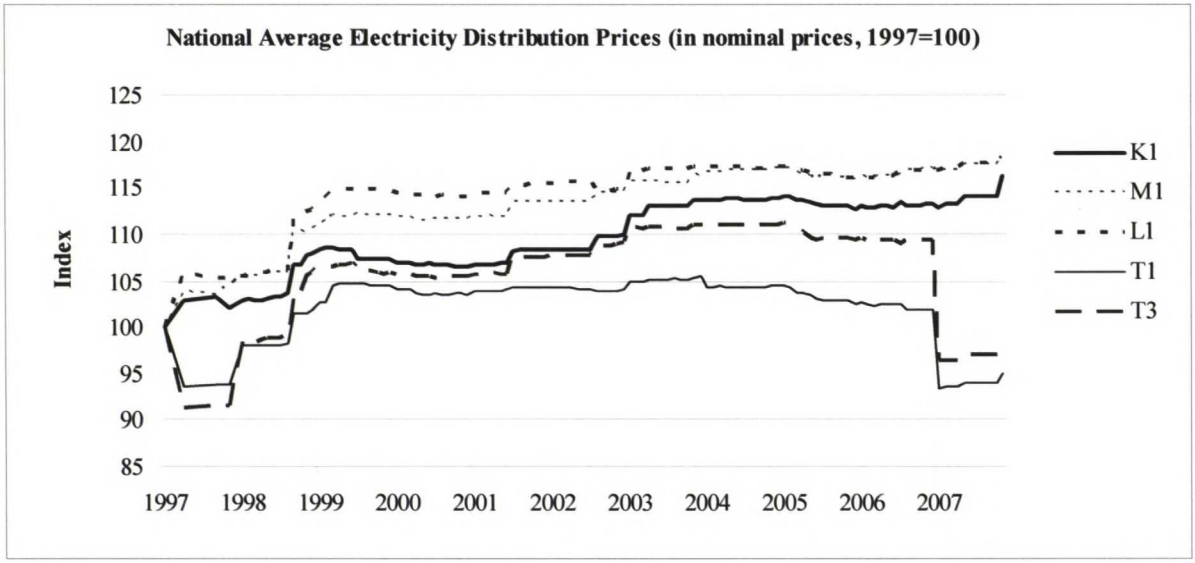


Figure 2. Development of average distribution price of electricity for certain consumer types in Finland in 1997-2007 (EMA, 2008c)

Description of price categories given above.

The price performance of the Finnish distribution utilities seems to be outstanding also on Northern European scale. Kinnunen (2005) found that the most efficient firms of the Nordic countries are located in Finland. However, one must note that structural differences between countries have a significant impact on the absolute price level (Jamasb & Pollitt, 2003).

Despite the good performance of Finnish distributors, there is still room for improvement in efficiency. EMA (2000) studied Finnish distributors' efficiency and concluded that the sector could reduce costs by €68 million, which accounts for 15% of total costs and 7.3% of total revenue.

2.1.3 Finnish electricity utilities

Regional electricity companies are responsible for electricity distribution on networks below 110 kV and subject to license. The Energy Market Authority grants network licences to organizations and utilities engaged in network operations, and building permits for constructing power lines of 110 kV and higher voltages (EMA, 2008b). There are still a large amount of distributors, whose business performance is secured to large extent by the prevailing regulation.

The total revenue of the Finnish electricity utility sector in 2006, including regional and national network operators, was approximately €4.7 billion of which €1.5 billion was derived

from distribution business. Corresponding distributed energy to 3.1 million end-users, excluding heavy industry with own generation, was 50.5 TWh. The total electricity consumption of Finland was 90 TWh in 2006. The two clearly largest operators in terms of revenue, Fortum Sähkönsiirto Oy and Vattenfall Verkko Oy had turnover of €198 million and €149 million, respectively. The five largest regional distributors accounted for about 45% total revenue (excluding Fingrid Oyj), total distributed energy and customers (see Table 1).

Table 1. Five largest electricity distribution businesses in Finland in 2006 (EMA, 2008d)

Company	Revenue k€	Distributed energy GWh	Customers pcs
Fortum Sähkönsiirto Oy	198 216	7 758	416 122
Vattenfall Verkko Oy	148 748	5 630	375 860
Helsingin Energia	82 825	4 370	332 646
Fortum Espoo Oyj	50 237	2 709	165 650
Savon Voima Oyj	47 069	1 722	105 413

Figures are from financial statements of 2006.
The national transmission network operator Fingrid Oyj is not included in the comparison due to its special role as a national grid operator.

Finnish electricity utilities vary in size and in ownership form in Finland. In 2006, the largest electricity distributor in Finland, Fortum Sähkönsiirto Oy, had over 416 000 customers and almost 600 employees operating in the distribution business (EMA, 2008d; Finnish Energy Industries, 2006). 15 largest utilities owned about 70 per cent of the distribution networks and served two thirds of the total customers in 2006 (Finnish Energy Industries, 2006). The smallest companies have been operating in the area of only one municipality and supplying few thousand customers. Vast number of the companies provide only 5 000 – 10 000 consumers. In spite of this, the sector is not very concentrated when taking into account the number of companies.

There are 91 companies operating lower voltage networks in Finland in 2007. In addition to this, 13 companies operate regional 110 kV network and the sole national transmission network operator, Fingrid, operates lines with voltage of 110-400 kV. Number of electricity utilities has decreased drastically from 200 companies in the past 20 years. Traditionally electricity utilities have been operating as municipal or public enterprises (OECD, 1997).

The size of the electricity utility and the form of ownership are very much linked. Only Helsingin Energia from the top five companies is owned by one municipality, whereas the others are under ownership of private persons or entities or consortium of municipalities. The vast majority of all the companies, over 60%, are in municipal ownership (Adato Energia,

2003). The municipal co-ownership became more common as the small operators merged beyond municipality borders.

Consolidation of Finnish electricity utilities has been in progress from the 1960s, when the amount of enterprises exceeded 300. In 1990 the amount was still as high as 141 (SENER, 2000). During the first wave of consolidation many of the small municipal companies merged into regional distributors that were responsible of network activities in the area of several municipalities. In literature this kind of regional companies are also referred as co-operatives (primary rural electric cooperatives) (Rose & Joskow, 1990)

The regional companies operated in geographical areas covering large part of a certain administrative region. One of the regional companies was formed in Northern Karelia (Pohjois-Karjalan Sähkö), one in Savolax (Savon Voima) and one in Central Finland (Keski-Suomen Valo). For example, Keski-Suomen Valo Oy in Central Finland merged the operations of Jyväseudun Sähkö, Jämsän Sähkö and Äänesseudun Energia. Some of the companies have as much as 25 different municipalities as their owners. The distributed ownership of the currently operating electricity utilities has its roots in this consolidation phase.

The second wave of consolidation hit Finland in the 1990s when regional companies were merged into large vertically integrated energy utilities. Regional companies such has Lounais-Suomen Sähkö Oy, operating in South-West Finland, Revon-Sähkö Oy in Ostrobothnia and Hämeen Sähkö in Etelä-Häme were acquired by either Imatran Voima (IVO) or Vattenfall. Table 2 lists the largest energy utility mergers in Finland between 1993 and 2006.

Table 2. Largest electricity utility mergers in Finland in 1993-2006

Target	Bidder	Acquired share	Year	Acquisition price (M€)	Turnover (M€)	Electricity sales (GWh)	Electricity customers (pcs)
Oy Terrasilvana Ab	LOSU[1]	100 %	1993/1994	64	-	355	26 689
Vihdin Sähkö	IVO	91 %	1994	17	98	300	23 500
Lapuan Sähkö	Vattenfall	100 %	1995	42	18	273	20 771
Jyllinkosken Sähkö	LOSU	100 %	1995	71	37	710	52 274
Tuusulanseudun Sähkö	IVO/municipalities	100 %	1995	30	29	383	26 830
Hämeen Sähkö Oy	Vattenfall	100 %	1995	159	115	2 000	150 000
Kainuun Sähkö	Graninge	74 %	1997/2001	84	48	1 027	50 000
Vantaan Energia Oy	Helsingin Energia	40 %	1998	126	111	1 800	87 000
Revon Sähkö Oy	Vattenfall	100 %	1999	136	36	620	43 000
Joensuun Energia Oy	Espoon Sähkö	100 %	1999	74	31	341	29 000
Keski-Suomen Valo Oy	Vattenfall	100 %	1999	178	54	925	74 600
Heinolan Energia	Vattenfall	100 %	1999	52	7	300	22 000
Savon Voima Oy	TXU	40 %	1999	71	97	-	98 000
Espoon Sähkö Oyj	E.ON	68 %	1999/2000	344	141	2 807	144 000
Hämeenlinnan Energia	Vattenfall	100 %	2000	87	28	315	25 000
E.ON Finland Oyj	Fortum	100 %	2006	745	234	2 700	167 500

[1]Lounais-Suomen Sähkö Oy.
Information on the acquisitions obtained from newspapers and journals: Helsingin Sanomat, Tekniikka & Talous and Kauppalehti. Data on targets is obtained from annual reports and financial statements.

In addition to the major mergers, several municipal electricity enterprises were incorporated to meet the requirements of new legislation. Energy market reform realized by Energy Market Act in 1995 obliged energy utilities to unbundle the electricity distribution operations by January 1st 2007 (EMA, 2008b). Consequently many municipal owned enterprises were incorporated and thus they merely changed their organizational form to limited company to have separate bookkeeping. Nonetheless, the absolute number of distributors has decreased, but there is still potential to pursue further consolidation. In the 21st century, only four large acquisitions have been made in addition to the incorporatisation cases. Decrease in the number of distribution network companies is shown in Figure 3.

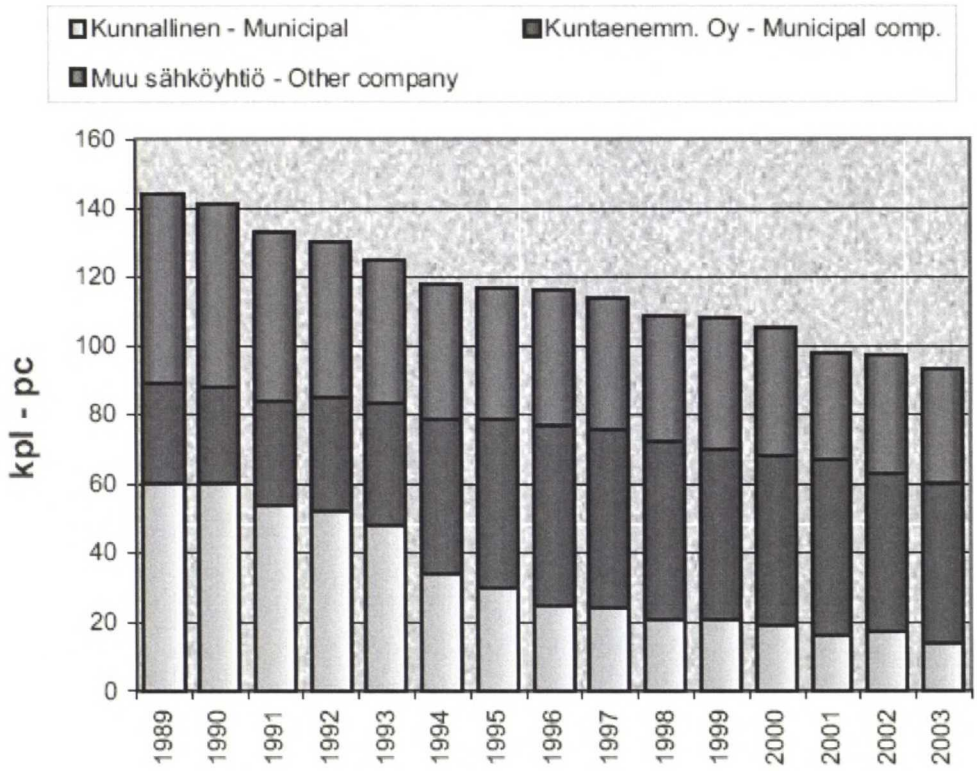


Figure 3. Owners of electricity utilities in Finland in 1989-2003 (Adato Energia Oy, 2003)

Distribution has been the profitable backbone of many electricity utilities, at least in the era of separate accounting. In 1997 the whole sector's adjusted net profit of distribution operations was 13% of turnover, whereas electricity retail sales reached only 3% (EMA, 1998). Five years later the profitability of distribution had increased to 15.1%, but sales operations decreased to 0.3%, measured with the same ratio (EMA, 2003). The profitability increase between 1998 and 2003 was not associated with price increase. The prices had stayed almost constant on average in nominal terms, which indicates some improvement in operational efficiency.

Despite the overall profitability, not all the distributors were in the black. The differences in profitability between the companies have been substantial. Net profit of a single company has been 50% of turnover at the maximum and loss -14% at the minimum in 2002 (EMA, 2003). In the same year, 38 of total 75 electricity sales business operated at a loss. The corresponding total revenue of sales and distribution business was €3.75 billion, from which 63% was derived from retail sales and the rest 37% from distribution.

2.2 Business within regulation scheme

Electricity distribution business is heavily regulated and is obliged to have separate accounting from other energy operations. Due to the transparency requirements and supervision, Pineau and Hämäläinen (2000) describe it as 'wires' business. According to the authors, wires business mainly consists of construction and maintenance of the grid. Former research shows evidence that distribution remains characterized by large scale efficiencies (see e.g. synthesis of Kwoka, 2005). Declining average costs has been recognized by economists as one condition for markets which may fail to yield an efficient outcome. According to researchers' proposals, electricity distribution shall continue as a regulated monopoly to secure public interest.

2.2.1 Principles of regulation in electricity distribution

The aim of regulation is to improve investment and operating efficiency of distribution companies to ensure benefits for consumers from the efficiency gains and secure the quality of supply. According to Baumol (1995), purpose of the regulation is to protect the public from detrimental consequences of competition failures. For regulation theories, see Berg and Tschirhart (1988), Laffont and Tirole (1993), Schleifer (1985) and Weyman-Jones (1995). In principle, regulation aims at creating prices that are non-discriminating and fair, to some degree cost-oriented, that have signalling and steering functions and are practical, simple and transparent.

There are several forms and degrees of regulation. Historically, the most commonly used regulation method has been bottom-up regulation, meaning that the regulatory authority bases its decisions on suitable price on cost information of the regulated utility (Kinnunen, 2005). One example of this type is rate-of-return regulation. In top-down regulation, a maximum price or revenue – a so called price-cap or revenue-cap – is set, which the regulated utility has to accept (see e.g. Acton & Vogelsang, 1989; Laffont & Tirole, 1993). The most simplistic formula for revenue control was presented by Averch and Johnson (1962):

$$Allowed\ Revenue = Expenses + (Rate\ base) \cdot (Rate\ of\ Return) \quad (1)$$

With the price-cap (revenue-cap) method, the regulator tries to solve problem of asymmetric information and lack of incentives for efficiency improvements by setting an upper limit for the price (revenue) according to the usually historical cost of the utility. The regulatory period normally lasts for several years, during which a firm is allowed to keep the profit that it can

extract through cost reductions. One problem with this approach is that the firm may have an incentive to increase its cost for the time of the new regulatory review in order to prevent sinking of the price (revenue) cap (Laffont & Tirole, 1993). Should this happen, efficiency improvements between regulatory reviews would not benefit the customers at all.

The yardstick competition method avoids the problem of asymmetric information by setting a benchmark (Schleifer, 1985). Here the regulator compares the utilities in the sector and determines the level of performance they should be able to achieve. This method creates an incentive for cost reductions and efficiency improvements, because the utility gains if it improves performance, for instance decreases its cost when the other utilities in the market do not (Schleifer, 1985). The benchmark is a shadow firm, representing an average firm in the group. Problems may arise if the utilities are very heterogeneous, which disables the creation of a suitable benchmark.

Regulatory methods can also be classified into ex ante and ex post regulation. Ex ante regulation focuses on setting regulatory frames before or at the beginning of the regulatory period while ex post regulation evaluates the performance of the firms in the sector after or at the end of the period (Berg and Tschirhart, 1988). Finland, as well as Sweden, bases its regulation scheme on ex post price supervision: the reasonableness of pricing is reviewed after the price-setting period (Kinnunen, 2005). The regulatory decisions are made individually for the affected utilities. Table 3 summarizes the most common regulation models in Europe.

Table 3. Summary of regulation models (Kinnunen, 2005; Viljanen et al., 2004)

Country	Regulation principle	Short description
Finland	Ex-post rate-of-return regulation	Regulator sets maximum allowed rate of return based on actual or defined cost data. Only rate of return above the band trigger have consequences for company.
Netherlands & Austria	Ex-ante price cap regulation	Regulator sets maximum prices for products. Prices of regulated services are adjusted annually by an inflation and possible efficiency requirement.
Norway, Denmark, Spain, Ireland & UK	Ex-ante revenue cap regulation	Regulator sets maximum annual income limit based on historical or defined cost data. Annual income level is typically adjusted by an inflation factor and possible efficiency requirement.
Sweden	Ex-post yardstick regulation	The allowed prices and return of a company depend on the performance of other companies, benchmark method.

2.2.2 Regulation of electricity utilities in Finland

In Finland the network operator is responsible for the condition of the network and the quality of the electricity supplied to consumers. One of the tasks of the EMA is to define the cost level that a company can achieve by efficient operation (Korhonen & Syrjänen, 2003). The power network licence granted to a distribution net operator specifies the licence holder's geographical area of responsibility where the distribution net operator has the exclusive right to construct distribution networks. The following description of regulation is based on the manuals published by EMA (2007a).

Within a distribution network area, the price of network services must not depend on where within the net operator's area of responsibility the customer is located geographically or the vendor. In spite of the fact that the distribution prices charged by different network operators differ from each other, customers are not allowed to invite tenders for distribution services. The factors affecting the distribution price (see Figure 2 in Section 2.1.2) are the amount of electricity supplied to the customer and the customer's power requirement as well as the voltage level at which the customer has been connected to the network.

According to the Electricity Market Act the network operations shall be unbundled legally from other electricity trade operations if amount of electricity distributed in 0.4 kV network has been at least 200 GWh/a during the past three years (Sähkömarkkinalaki, 2007). In other cases, only separate income statement and balance sheet shall be drawn up for network and other electricity trade operation.

The Finnish regulation applies revenue-cap model (price-cap in theory) with ex-post supervision and efficiency requirements. The regulatory authority in Finland evaluates the performance of a network utility by comparing it with the other utilities in the sector. As mentioned in the previous section, the advantage of this approach is that the firms will not benefit by reporting their costs falsely because the result of regulation also depends on the performance of other utilities in the sector.

The revenue-cap calculation methodology includes determination of the value of capital invested in network operations, calculation of reasonable return and adjustment of profit and loss account and the efficiency requirements. Based on these, regulatory body calculates the revenue from electricity distribution operations and assesses it against the reasonable revenue. Table 4 shows the calculation of adjusted profit which is used in the assessment.

Table 4. Simplified principle for calculation "actual adjusted profit" (EMA, 2004)

Operating profit (loss)
+ Actual combined controllable operating costs
- Combined controllable operating costs according to the efficiency goal
+ Paid network rents
+ Depreciation according to plan from goodwill
+ Depreciation according to plan from electricity network
- Straight-line depreciation calculated on the basis of the repurchasing value of network assets
+ The net balance sheet change in accrued connection charges
=Adjusted operating profit
+/- Other adjustment items
=Profit before taxes
-Income taxes
=Actual profit (adjusted)

The regulator defines the reasonable rate of prices or return on capital invested (asset base) based on calculation models that vary from country to country. Table 5 lists the characteristics of the Finnish regulation calculation methodology and compares it to other Nordic distribution revenue schemes.

Table 5. Factors of allowed return in Finland, Sweden and Norway (Teijonsalo, 2008; Kinnunen, 2005; Viljanen et al., 2004)

	Finland	**Sweden**	**Norway**
Regulation principle	Rate of return	Yardstick regulation with benchmarking based on hypothetical efficient company	Revenue cap based on historical costs, efficiency requirement and return on book value
Regulatory asset base	Technical present value of network	Repurchase value for fictitious network calculated with model parameters	Historical book value of network
Calculated on regulatory asset	WACC with parameters defined by the Regulator	Fixed interest rate defined by the Regulator	Risk free interest rate (three year average) plus 2 percentage points
Depreciation	Straight line depreciations from repurchase value	Calculated from fictitious network	Historical depreciation (inflated)
Operating costs	Historical costs (four year average)	Percentage of fictitious network plus customer specific adjustment	Inflated historical costs (three year average)
Efficiency requirement	General 1.3% adjusted by network volume increase	Requirement included in the model parameters	General 1.5% and company specific 0-5.2% based on DEA model
Allowed return	Based on WACC	Actual operation vs. fictitious network parameters defines return	2-20% return on book value of network assets depending on efficiency

Business expenses may be roughly divided into three classes: capital costs, controllable operating costs and non-controllable operating costs. The reasonableness of the capital costs of an enterprise (return on invested capital and depreciation) is separately regulated in the supervision model and no efficiency goal will be set for them. Efficiency assessment does not

concern either non-controllable operating costs in calculations of the reasonableness of pricing, because by definition, the said cost items are beyond the control of the enterprise.

Supervision of reasonableness in pricing was altered starting from 1st January 2005. The new supervision format includes a regulatory period and is based on ex ante assessment. The first regulatory period with the new model lasted for the years 2005-2007, which is followed by four year review periods. The Electricity Market Authority supervises distribution prices on a regular and spontaneous basis and the supervision applies to all electricity utilities.

Under the supervision format a network operator may, in some individual year during the regulatory period, gain earnings from its operations that are higher than the earnings limit that is considered reasonable without immediate intervention by the supervising authority. As a rule, however, the network operator should allow for any rate of return that exceed the reasonable level when pricing for other years of the regulatory period, so that the pricing is reasonable when viewed over the regulatory period as a whole. EMA obliges the distributor to refund the windfall profit to the consumers by lowering tariffs during the next regulatory period (EMA, 2007a). Furthermore, interest must be paid for significant windfall profit. The following table clarifies the model (EMA, 2004):

+	*Sum of actual adjusted profits in various years of the regulatory period*
-	*Sum of reasonable returns considered reasonable in various years of the regulatory period*
=	*Windfall profit (+)/ windfall loss (-) accruing from the regulatory period*

Many companies have decided not to charge the full allowed price, which can be explicitly confirmed from the windfall profit (loss) statistics. In addition, the largest windfall losses seem to accumulate for the rural electricity companies (Saajo, 2008). However, the windfall profits and losses were published for the first time in 2007 and they cover only years 2005-2006, which were the first two years of the new regulation scheme. Should this statistics represent the pricing on a regular basis, the average price increase margin would be 26% per company and 6 % in the sector (EMA, 2008a; Teijonsalo, 2008). Therefore, one cannot draw conclusion about the existence of sustainable undercharging exercised by certain municipality owned distributors. Table 6 lists the largest windfall profits and losses in 2005-2006.

Table 6. Windfall profits and losses in 2005-2006 and adjustment potential of annual turnover (EMA, 2008a)

Top 10	Distributor	k€	%	Last 10	Distributor	k€	%
1	Jakobstads Energiverk	1 930	-17,0 %	1	Muonion Sähköosuuskunta	-1 890	110,4 %
2	Pellon Sähkö Oy	140	-15,0 %	2	Utsjoen Sähköosuuskunta	-960	92,1 %
3	Karhu Voima Oy	660	-9,9 %	3	Enontekiön Sähkö Oy	-1 550	88,0 %
4	Oy Turku Energia Ab	4 520	-8,1 %	4	Kittilän Sähköverkko Oy	-1 770	73,2 %
5	Joroisten Energialaitos	220	-7,9 %	5	Lehtimäen Sähkö Oy	-730	72,7 %
6	Etelä-Suomen Energia Oy	450	-5,3 %	6	Rantakairan Sähkö Oy	-1 570	72,4 %
7	Kokkolan Energia	410	-3,7 %	7	Yli-Iin Sähkö Oy	-640	67,5 %
8	Oulun Seudun Sähkö Oy	580	-3,6 %	8	Ilmailulaitos Helsinki-Vanta	-1 200	64,6 %
9	Fortum Sähkönsiirto Oy	12 810	-3,3 %	9	Sähkö-Virkeät Oy	-1 470	56,0 %
10	Imatran Seudun Sähkönsiirto	370	-2,5 %	10	Lankosken Sähkö Oy	-1 130	55,8 %
	Total sector	-173 380	5,8 %				

The absolute figures are accumulated windfall profits (losses) from 2005 and 2006.
Percentage indicates the needed change in annual distribution turnover in order to reach the level of maximum allowed profit. Companies with negative sign have exceeded the revenue cap and vice versa.

3 Electricity utility mergers

Gradual opening of energy markets has created possibilities for pursuing electricity utility mergers. First market-based utility mergers have occurred and been studied in the US, which has acted as the pioneer of electricity market liberalization. Privatized utilities, so-called investor owned utilities were listed in public exchanges and merged, however, only with approval of the regulatory body. This consolidation of the sector has sparked many electricity utility merger studies on both regulated and unregulated subsectors. In addition to the pure merger event studies, background, incentives and implications of the mergers have been investigated in the US electricity utility sector. In Europe, the slower pace of market liberalisation has only enabled privatization studies and studies on utility operations.

Vast numbers of electricity utility studies, especially regarding electricity distribution, examine operational efficiency, its drivers and changes in connection with ownership transfer from public to private. One of the most studied fields is economies of scale effect in electricity distribution. Vertical integration of electricity utilities and operational efficiency yielding from change of ownership form has been studied in the context of electricity sector development.

This section introduces literature related to electricity utility mergers, concentrating on distribution business. First, some results of the few utility mergers studies are presented in Section 3.1. Second, incentives to mergers are discussed based on merger and operations studies in Section 3.2.

3.1 Results of event studies on regulated electricity sector mergers

Regulation and the nature of monopoly industry have an impact on returns for target and bidder firms around the merger day and on the takeover activity. Investors, management, regulatory body and customers all have their own incentives and impediments to mergers. The extent to which these interest groups become involved in the merger process affects its outcome. The role of the regulator is especially important in the takeover context.

In heavily regulated electricity distribution regulators are charged with providing the discipline often ascribed to market forces. An argued benefit of the market for corporate control is its ability to discipline managers (Jensen & Ruback, 1983). In a regulated sector, regulatory body can penalise poorly managed firms and thereby force managers to improve

performance. In an extreme case, regulator may be the only source of discipline. Previous literature shows that regulation affects returns of electricity utility stocks around merger day.

Mergers in a regulated industry show smaller returns for both bidders and targets than those in non-regulated sector. Targets of diversifying mergers earn positive abnormal returns, but the returns are not as large as returns earned by firms undertaking mergers in non-regulated industries (Leggio & Lien, 2000). Ray and Thompson (1990) studied abnormal returns around the merger event day and found returns to bidders and targets to be positive, but smaller than in other industries. Positive returns have also been found by McLaughlin and Mehran (1995). Target returns were, however, smaller than those experienced in the context of other industries. Not only the returns, but also the takeover activity is affected by regulation.

There have been formidable regulatory and legal obstacles to tender offers for public utilities. McLaughlin and Mehran's (1995) empirical results show that, in comparison to non-regulated target firms, target utilities in hostile offers are much less likely to be acquired. This results from the requirement that the merger receives an approval from regulator as well as from shareholders (Leggio & Lien, 2000). The requirement for a merger to be also in ratepayers' best interest reduces the likelihood of its success. Robison et al. (1995) studied electric utility company announcements on corporate restructurings and associated them with plans to diversify the business. The authors find insignificant negative abnormal returns for bidders around the announcement date and attribute this to the uncertainty that these plans will receive regulatory approval.

The recent cases in Europe, however, show that regulatory approval does not have that large impact on merger outcomes. Codognet et al. (2003) state that merger remedies are rather infrequent when competition problems arise: only 17 out of the 135 studied cases in Europe were approved subject to conditions related to competition law. In Finland there is no law that would prevent mergers between electricity distributors and/or generators, although a cap for market share exists (Kinnunen, 2005).

A completed merger that increases the combined market capitalization must have certain implications in a regulatory context, where institutional, legal and political requirements must also be met. Cox and Portes (1998) listed reasons for positive stock market returns for both the bidder and the target. The merger produces net economic benefits; shareholders will in aggregate benefit from the merger, the merger may affect competition in a particular way and

a ratepayer sharing mechanism may be legally required. The evident reason for smaller returns and lower takeover activity is the dilution of synergies due to regulation.

The potential synergy gains from merger cannot be utilized as they are passed on to customer prices by the regulator. Ray and Thompson (1990) noticed that in all of their merger cases, the ratepayers (customers) were not worse off after the merger. Leggio and Lien (2000) confirms that regulator does not allow customers suffer due to approved merger. In addition to reaping improved level of cost efficiency, the regulator may receive information about the regulated companies that was previously hidden.

Public hostile takeovers appear to solve problems of asymmetric information. Regulators typically know considerably less about the firms they regulate than management of those firms (Kinnunen, 2005). In the context of regulatory proceedings, the information may flow to their potential competitors, consumer and ratepayer advocates, who may also have an incentive to supply regulators with information that is particularly attractive to them (Cox & Portes, 1998). Furthermore, although rate of return is normally not constantly monitored, bidding firms can expect detailed rate reviews in connection with their offers (McLaughlin & Mehran, 1995).

Regulator may limit takeover benefits by refusing to include takeover premium in post-acquisition rates. High bids increase the likelihood of success, but high bids also alert regulators and increase the probability that the premium paid will not be recovered in future rates (McLaughlin & Mehran, 1995). Nonetheless, takeover premium cannot be recovered in electricity distribution rate base after the acquisition in certain regulation schemes anyway. For example in Finland, from the rate base for required return any goodwill would be excluded (EMA, 2007a). Higher post-takeover prices would be difficult to apply also due to opposition of the intervening groups.

In acquisition of a utility, the bidding firm will often have to weigh the costs of concessions necessary to eliminate or reduce opposition from various intervener groups against the potential gains from the acquisition. McLaughlin and Mehran (1995) found that bidders have offered premiums to consumers through proposals for lower or frozen rates. They also mention competitors, government agencies and environmentalists as potential interveners.

3.2 Incentives for mergers in electricity sector

The incentives for public utilities to effect business combinations are similar to those in non-regulated industries, although existence of regulation may hamper full utilization of the possible benefits from mergers. Ray and Thompson (1990) studied motives for mergers in four cases and conclude that all in all there are no powerful incentives for mergers which arise within the investor-owned utility sector. They found that most of the mergers were to provide synergy gains although some managerial incentives were present as well. Hendricks (2003) agrees on scarcity of incentives, but due to limited possibilities in generating organic growth, he finds clear motives for mergers in energy utility sector:

- Vertical integration (corporate portfolio balance)
- Cost synergies and operational efficiencies
- Value chain synergies

From the variety of incentives to electricity utility mergers narrow electricity distribution sector can utilize only few due to heavy regulation. Achieving operational efficiencies related to economies of scale is an evident motive for a merger and one of the most studied subjects in electricity utility literature. Benefits of vertical integration have also been discussed in several studies on the US electricity utility sector. European examples of this are Norwegian distributor-owned producers, in which a cluster of distributors (owned by municipalities) own shares in proportion to their power purchases from the common producer (Midttun & Summerton, 1998).

A peculiar motive for especially utility acquisitions is transfer of ownership from public to private and subsequent switch to profit-orientated pricing. This issue has been addressed by US-based studies and recent studies in the Nordic Countries. Related to ownership change, there is dispute whether the municipal owned utilities are more inefficient than private (Hollas & Stansell, 1988). The main suggested reasons for mergers in electricity distribution are described by Pineau and Hämäläinen (2000) and are presented in the following matrix (see Figure 4). Distribution sector, however, lacks the dimension of market type.

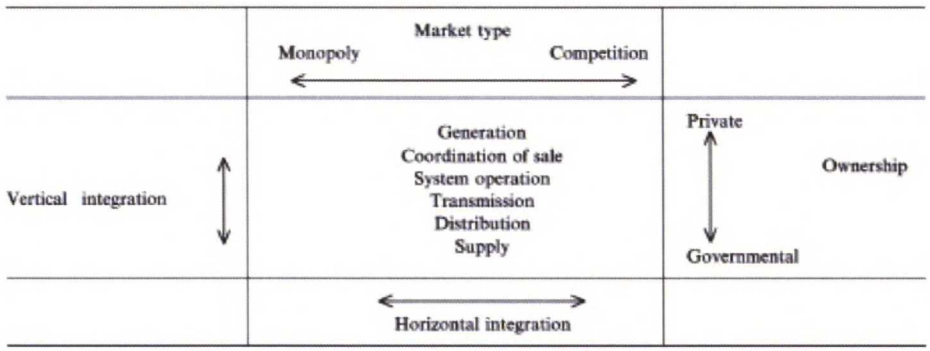


Figure 4. Dimensions of restructuring electricity utility sector and companies (Pineau & Hämäläinen, 2000)

In addition to the aforementioned issues, more general motives for utility mergers have been found. Leggio and Lien (2000) state that deregulation act in 1992 accelerated the merger activity in the US as undervalued utilities appeared in the market. However, the activity slowed down and positive abnormal returns for bidders were gone until 1994. There were no reasonable priced utilities left in the market after the regulatory body started to scrutinize the mergers more carefully. McLaughlin and Mehran (1995) find the undervaluation motive to be important in the utility market before the restructuring among other managerial motives such as expanding assets under managements control or expanding natural monopoly power. These motives, however, are not further studied in this Thesis.

3.2.1 Vertical integration

In liberalised energy markets mergers have created or have been performed by vertically integrated business combinations in vast number of cases. In Europe vertically integrated companies have acquired companies in all the electricity business line from generation to other vertically integrated companies since 1998 (Codognet et al., 2003). Distribution companies have reinforced their partnership with larger companies with full or partial acquisitions.

Pineau and Hämäläinen (2000) explain appetite of generators for distribution businesses with retail market knowledge and information on customers the distribution companies possess. According to the authors, identifying local load pattern would be the pinpoint of success and profitability for sellers. Midttun and Summerton (1998) suggest that local knowledge can provide basis for expanded co-operation between producer and distributor in meeting local end-users' needs. The other end in the value chain, energy procurement, could also be enhanced through vertical integration.

Studies by Midttun and Summerton (1998) and Yatchew (2000) find possible improvements in distributors' power purchase functions. Distributors' transaction costs for obtaining power, information costs, procedural costs, negotiation cost related to energy purchase could be reduced by diversifying the business downstream (Midttun & Summerton, 1998). Yatchew finds opportunities to lower costs by challenging a large power supplier with an own procurement function. Some of these improvements can be made within vertically integrated companies, but the benefits allocated to the distribution unit are directly passed on to customers in most regulation schemes.

The regulation obliges the distributor to lower fees if the historical cost of operations has decreased. Any achievement in decreasing cost of, for example, distribution electricity losses or personnel will flow directly through regulatory accounting, which is applied to the distribution operations regardless of the business combination it belongs to. Besides in Finland, vertically integrated companies are now required to ring-fence production from distribution by legally separate accounting in Norway and Sweden as well (Pineau & Hämäläinen, 2000).

In a move to increase the utility's overall rate of return, electric utilities may diversify into unregulated business where the return on equity is not pre-determined by regulators. The market appears to value the electric utilities' decision to merge more favourably when the reason for merging is to increase the return on equity as opposed to merging in attempt to limit future competition (Leggio & Lien, 2000).

3.2.2 Economies of scale

Economies of scale have been studied widely in the electric power sector. Although electricity distribution has received far less attention than power generation in empirical production function literature, few studies have addressed returns to scale in distribution (see synthesis of Kwoka, 2005). Electricity distribution is generally viewed as a natural monopoly and therefore many of the cost efficiency studies have been conducted in order to assess the arguments for regulation.

Early studies on US electric utilities report evidence on initial scale economies in distribution. Meyer (1975) found economies of scale with small outputs, whereas Neuberg (1977) suggests that returns to scale increase but not over the entire existing output range. Huettner and Landon (1978) associate observed economies of scale with density of customers. Later studies

were to improve robustness of these results that were based on limited control variables and sample sizes.

Studies by Roberts (1986) and Nelson and Primeaux (1988) examine different components affecting economies of scale. Roberts states that a change in the quantity of electricity supplied by a firm will have a different impact on cost depending on whether the output is supplied to existing customers or to an increased number of customers. Nelson and Primeaux studied economies of scale with respect to output and the number of customers. Economies of scale appear to have been exhausted by the larger firms in their sample when holding the output per customer constant. In recent years economies of scale have been studied in countries other than the US.

Hjalmarsson and Veiderpass (1992b) on Sweden, Burns and Weyman-Jones (1996) on England and Wales, Salvanes and Tjotta (1998) on Norway, Filippini (1998) on Switzerland and Yatchew (2000) on Canada find economies of scale, but by applying slightly different methodologies. According to Hjalmarsson and Veiderpass, primary source of productivity growth is related to network density, in other words the economies of increasing the amount of electricity supplied when the network length is held constant. Filippini finds constant returns to scale throughout the data, although in his sample the companies had rather small service areas. Yatchew (2000) report decreasing economies of scale in Canada and estimates the threshold of efficient scale as 20 000 customers.

The latter studies discuss possible restructuring of distribution sectors with vast number of small companies. Filippini (1998) associated productivity growth in the rural areas with structural rationalization of rural electricity distribution, whereby many small service areas were merged into large ones. Study of Salvanes and Tjotta (1998) indicates that there is some cost efficiency gains from merging small distribution companies into larger ones but that the cost savings diminish with size. On the contrary, Yatchew (2000) is pessimistic about horizontal mergers between distributors concluding that they are not likely to produce substantial scale of economies in the operation of their usual wires business that is the construction and maintenance of the grids. Finally, Kinnunen (2005) on Finland states that big utilities are more efficient than small ones.

The latest study by Kwoka (2005) develops the methodologies used in the earlier studies and produces comprehensive results with a sample of several hundred US-based firms. Kwoka's

study finds significant economies of scale in distribution (also in wires, which is the business of construction of networks) at low output levels, holding system size and customer density constant, but elsewhere in the output range the cost gradient is modest. These results provide some justification for the restructuring of electricity utility sector that has occurred, but they raise questions about the efficiency effects of mergers between utilities with extensive supply business. The economies of scale effect is apparent in Figure 5 and Figure 6.

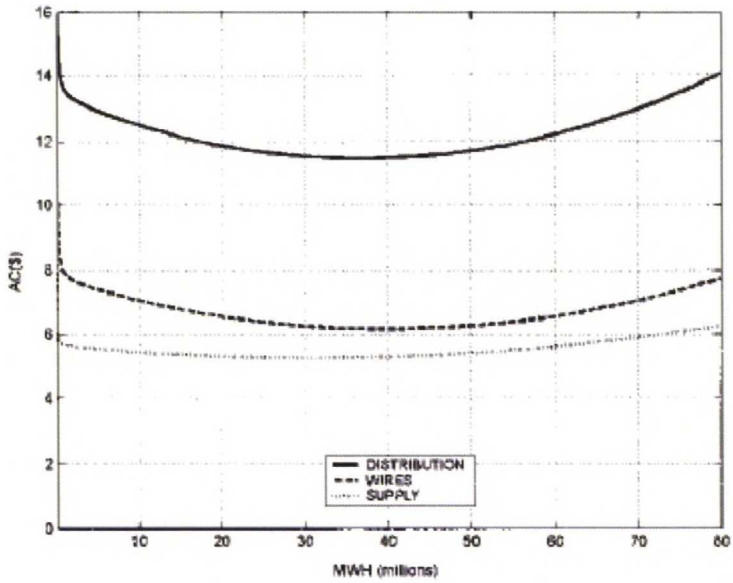


Figure 5. Economies of scale effect in distribution, wires and supply (Kwoka, 2005)

Figure shows estimated costs per supplied energy on x-axis (MWh).

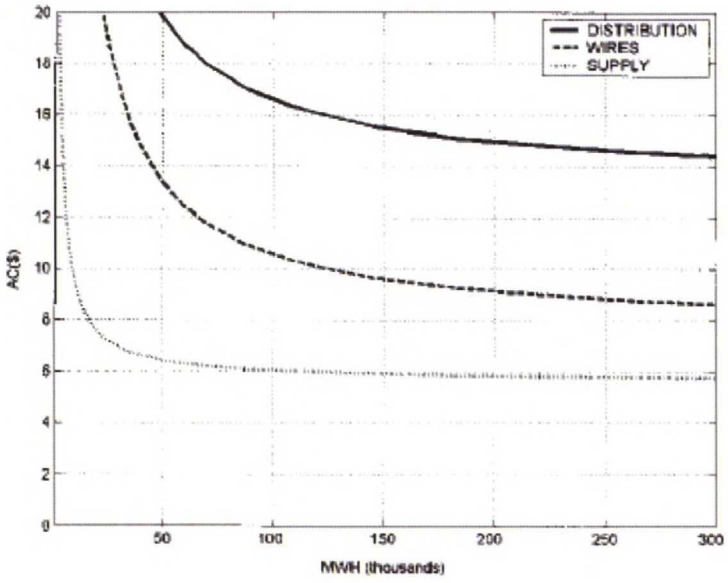


Figure 6. Economies of scale effect at small outputs (Kwoka, 2005)

Figure shows estimated costs per supplied energy on x-axis (MWh).

According to above-mentioned studies, reasons for economies of scale effect can be extracted. Geographic size and customer numbers are quite important and economies are significantly stronger for the infrastructure or wires business than for the marketing function performed by electricity utilities. Customer service costs are strongly related to length of the network and to customer numbers in linear form (Kwoka, 2005). However, Kwoka finds that sales expenses, in other words overhead costs, are not particularly related to output or customer numbers. Returns on scale would also arise from joining two complementary transmission systems, which would improve utilization of generation assets (McLaughlin & Mehran, 1995).

There are clear scale effects with respect to output and to some degree with respect to number of customers, but size of service territory had little or no effect on efficiency. Studies on European countries suggest that consolidation of small utilities whose service territories are adjacent is likely to reduce costs. This implies that utilities that vary considerably in size may nonetheless remain fairly cost-competitive and viable. However, one must note that when regulation is in place, the cost reductions in operations are gradually passed on to customers in the following review periods.

3.2.3 Operational performance and ownership change

Privatizations and opening of electricity sector in many countries has inspired authors to dig differences in efficiency between publicly and privately owned utilities. Regarding implications of privatization, Averch and Johnson (1962) studied profit-maximising behaviour patterns under regulatory constraint. Subsequently, Moore (1970) continued with a study on regulation and found different profit targets between public and private utilities. He noticed that municipality owned companies did not charge the full allowed price and that private ownership (investor-ownership) reduced costs only to small extent. Latter studies agree on the different pricing targets, but report mixed results on the efficiency variations between different ownership forms.

De Alessi (1974), Hollas and Stansell (1988), Hollas et al. (1994) on US and later Hjalmarsson and Veiderpass (1992a) on Sweden found internal restrictions on municipality owned utility pricing. The latter authors discuss that municipalities cannot actually use pricing as taxation method as "not for profit law" prohibits the utilities from charging profit-maximizing price. Hollas and Stansell argued that rural cooperatives overutilize labour inputs

and do not maximize profits. De Alessi listed also other factors that could be changed with ownership change from public to private: operating costs, readiness to adopt-cost reducing innovations, length of managers' tenure and variation in rates of return. However, according to several authors pure operational costs might not change significantly in connection with ownership change.

Perception of the early studies in the 1970's was that publicly and privately owned utilities are not significantly different in terms of the overall price and technical efficiency (see synthesis of Färe et al., 1985). On the other hand, they find that publicly-owned utilities have better ratings in terms of purely technical efficiency, but are worse than privately-owned utilities in terms of congestion and scale efficiency. Atkinson and Halvorsen (1986) applied shadow prices of regulation and state that publicly-owned and privately-owned regulated electric utilities are equally cost inefficient in the US. According to Hjalmarsson and Veiderpass (1992b) economic organization does not seem to be related to productivity growth in any significant way.

Previous view on efficiency differences is challenged by studies of Hollas and Stansell (1988) and Burns and Weyman-Jones (1996). Hollas and Stansell found municipal utilities charging lower rates although they were less economically efficient than private utilities. In the restructuring phase of electricity sector in England and Wales, there was a significant positive effect on cost efficiency in the years following privatization (Burns & Weyman-Jones, 1996). The final word on effect of ownership on efficiency is still left to be said, but the studies agree on certain important matters.

Switch to private ownership would introduce corporate development programs targeting to improved competitiveness. Change of ownership may introduce corporate restructurings and changes in procedures involving an injection of competitive elements (Domah & Pollitt., 2001). Investor-owned utilities tend to adopt more eagerly new technology than their municipally-owned or cooperative-owned counterparts in the industry (Rose & Joskow, 1990). Investor-owned utilities also exhibit more involvement in industry research and development activities and organizations.

4 Municipal ownership of electricity utilities and profit orientation

Municipalities provide utilities through business-type enterprises which are owned and run by government and which are financed by service fees or charges (Tyer, 1989). These activities differ from other types of municipal services in that they commonly support themselves and sometimes generate revenues beyond their costs. A good example of Finnish profit-making public utility is Helsingin Energia, the energy utility of city of Helsinki. With turnover of €622 million its profit before tax and extraordinary items was €263 million and operating profit margin was 40% in 2007 (Helsingin Energia, 2008).

Previous research has found evidence on two different business approaches of municipal utilities; subsidization of the inhabitants in the form of low prices and profit-seeking pricing resulting in revenue contributions to the municipality. Former section already hinted that municipal utilities would not maximize the revenue collection. Furthermore, the subsidization concept has been widely applied in Finland (Teijonsalo, 2008).

This section studies the ways the municipalities' use utility pricing in their policy-making and financing. First, revenue collection through utilities is addressed. This is followed by discussion on subsidies to inhabitants and local companies in the form of utility prices below profit-maximizing level. Lastly, municipalities' approach to investments and cost of capital is touched.

4.1 Municipal electricity utilities as source of revenue

Municipal enterprises may be sources of revenue for cities faced with declining tax bases, tax limitations or other financial difficulties. Municipal enterprise profits offer substantial opportunities for tax substitution or improvement of other city services (Dilorenzo, 1982). Furthermore, utility profits are a useful method of revenue diversification (Dehoog & Swanson, 1988). Although the revenue collection may be advantageous for the municipality as a whole and be politically lucrative financing option, it may accelerate municipal spending. Few studies on municipal or city utilities have investigated public financing and the relationship between public spending and profits from municipal enterprises.

Utility revenues often have a large role in municipality financing and substitute other sources of income. Strauss and Wertz (1976) found per capita own-revenues in cities with public

electric companies to be 25% to 45% lower than in other cities. Dehoog and Swanson (1988) studied municipal utilities in Florida and concluded that they provided substantial amount of the local revenue. Rubin (1988) stresses that electricity utilities are means of taxation. More recent study by Borge (2000) suggests that when governmental sources of funds become restricted, municipalities rely on utility profits.

Revenues could be also used for funding the utility's capital improvements, substitute substantial tax exemptions, or to subsidize other less financially lucrative municipal enterprises (DeHoog & Swanson, 1988). They also suggest that, in general, cities subsidize certain services, such as mass transportation, break even on others such as, water, sewer and make a profit, if possible on electric utilities.

A municipality may perceive the revenue as additional income and thus use it to provide services beyond the necessary level. Results of Deno and Mehay (1988) confirm that there is direct connection between cross subsidies from municipally owned water utilities and city spending. DiLorenzo (1982) studied New York's utilities, whose internal subsidization was likely to have stimulated expenditures, leading to an increase in local tax collections. Tyer's (1989) study on South Carolina cities shows that revenue from electrical utilities result in increased spending on municipal services and subsidization of the property tax with utility fees.

The degree of control the governing body has over the enterprise and political atmosphere are meaningful factors when deciding on utility rates as a part of the total local financing. Tyer (1989) shows that cities with little or no control over their electrical utilities transfer hardly any money to the cities' general funds. He continues that it is logical for public officials to opt to access revenue sources which allow them to avoid the political hazards of public tax increases. Public avoidance of taxes seems to be a major incentive for using profit-orientated electricity utility pricing (Rubin, 1988).

4.2 Subsidization through electricity prices

Contrary to what was presented in the previous section, a municipal electricity utility may be assigned to subsidy consumers with cheap electricity. Previous research shows evidence that municipally owned electric utilities have a tendency not to maximize the price level. Undercharging may apply to all customers or to certain customer segments. However, enterprises can serve as a significant drain on city revenues if they are not fiscally self-

supporting through user charges (DeHoog & Swanson, 1988). As was mentioned in the section above, political atmosphere again has an influence on the pricing decisions.

Rubin (1988), Hollas and Stansell (1988) and Hollas et al. (1994) found evidence on different pricing behaviour between municipality owned and privately owned electric utilities. Rubin noticed that municipal enterprises ran fee deficits. Rural cooperatives, in other words companies owned by several municipalities, may overutilize labour inputs and do not maximize profits (Hollas & Stansell, 1988). Hollas et al. studied the effect of municipal and cooperative ownership forms on electricity distributors' prices and found empirical support for the argument that municipal ownership reduces residential and commercial rates.

Municipality utilities set rates to maximize political support. Municipal distributors charge lower rates to potentially powerful, high-priority customers (Hollas et al., 1994). In comparison of municipal to cooperative utilities, they found that municipals practise non-economic based price discrimination by favouring residential and commercial customers relative to industrial customers. Hjalmarsson and Viederpass (1992a) found internal restrictions on municipality owned utility pricing in Sweden. The authors discuss that municipalities cannot actually use pricing as taxation method due to strong local opposition on high rates.

Literature lacks studies on Finnish utilities, but publications of the EMA (2008a) hint about underpricing exercised by the Finnish municipality owned electricity enterprises. Publication on windfall profits and losses states that the companies should increase their prices (revenue) by 5.8% on average in 2008 in order to reach the profit-maximizing level (see Section 2.2.2) (EMA, 2008a). Evidently, most of the total windfall loss is created by the municipality owned companies as they represent over 60% of the sample and the largest companies in terms of turnover have exceeded the allowed maximum level.

4.3 Municipal cost of capital

The previous sections provided two ways how a utility can contribute to the owner municipality's economy. A utility's contribution, in the form of revenue or low prices, needs to be valued if the utility will be sold to private investors. As stated above, return on municipal utility shares in the form of dividends or capital gain in liquidation is commonly used as a substitute for other local revenue or to improve public service level. Low rates would probably be complemented with taxes or debt financing.

From the perspective of municipal economy, there is indeed an opportunity cost for the utility contributions. Previous research provides mixed interpretations to appropriate discount rate for valuing this cost. Investment manual for Finnish municipalities gives some guidelines on how funds held by a municipality should be valued.

One approach to the problem is to start from deciding the use of funds; are they for investing or consumption purposes. Sandmo and Dreze (1971) found that applicable discount rate varied according to the extent to which the investment was financed from consumption. However, most authors have acknowledged that the risk of the investment needs to be completely or partially taken into account in returns on municipal investments.

Sandmo (1972), Flemming and Mayer (1997), Brealey et al. (1997) and Grout (2003) argue that risk of an investment should not be dependent on the investor. Sandmo states that the public sector's discount rates should always contain a risk margin, and that this margin should correspond to the one used in the private sector for investment in the same risk class. According to Flemming and Meyer's (1997) synthesis, currently prevailing view states that cost of capital of equivalent projects is the same in the private and public sector.

Brealey et al. (1997) and Grout (2003) discuss that equity risk premium applies as much, or nearly as much, to public as to private financing. In the presence of complete capital markets, taxpayers can shed any risk that accrues from the undertaking of a project by the government by trading in the capital markets (Brealey et al., 1997). The risk premium demanded by the capital markets is the cost of shedding this risk. It is therefore the risk premium demanded for both public- and private-sector projects. Therefore risk margin may be the same, but naturally the borrowing cost can be lower.

Some may see appropriate to use marginal borrowing cost as the cost of capital for municipal investments. Spackman (2004) refers to US Federal Agencies that use the government borrowing rate as the discount rate. Lind (1990) argues the minimum discount rate to be the borrowing rate when evaluating potential net effects of projects which represent net additions to the budget. This applies regardless of the source of the funds, whether taxes are increased or the financing need is satisfied by borrowing from market. Spackman (2004) concludes that the various alternatives discount rates lie between marginal borrowing rate of a government and the market return. This view is supported by the municipal investment manual.

The manual for municipality investments (Myllyntaus, 2002) states that the minimum return requirement shall be enough to guarantee a direct investments' initial value in real terms. Granting of a loan to an enterprise would require market interest rate, average borrowing rate of the municipality or market yield. When investing excess cash in long-term bond instruments, the target return is the market interest rate for corresponding instrument or the municipality's average borrowing rate. Equity investments' return requirement is the index return in general. However, if the principles of low-risk municipal investments are followed rigorously, equity investments should be abandoned completely, at least in short-term investing.

5 Summary of Literature Review and hypotheses

This section summarizes the Literature Review and presents the hypotheses to be tested in the following empirical part of the study. The previous sections discussed the context of the Finnish electricity utility mergers. First, the business sector and its regulation were described. Second, findings on implications of electricity utility mergers and incentives to pursue them were addressed. Finally, observations on municipal utility behaviour in terms of pricing and municipal owners' requirements for return on their utility assets were discussed.

The Finnish electricity utility sector is highly fragmented and most of the firms pursue non-profit maximizing policy from the viewpoint of regulation. The largest firms are either privately owned or in co-ownership of several municipalities. Regulation offers reasonable return for the investors, but all the upside from cost-cutting is diminished in the next regulatory review period as the allowed revenue is assessed against historical costs.

Despite the well-established regulation and its transparent principles, most companies opt for not charging the full allowed price according to latest statistics. The same pricing approach applies also to electricity retail sales, where many businesses sell electricity below the wholesale price making the business unprofitable for the sector's companies on average. Prices in distribution, in the non-competitive part of the sector, have almost remained unchanged in real terms, partly due to aforementioned pricing policies.

Besides pricing, economies of scale, vertical integration, improvement in operating efficiency and regulator approval are factors affecting the attractiveness of a merger between electricity utilities. Event studies show that shareholders of target companies in regulated industries gain less from a merger than in a non-regulated industry on average. Shareholders do not fully benefit from synergies that could arise from vertical or horizontal mergers, since the regulator intervenes in the takeover process and reaps subsequent efficiency gains. Thus opportunities for the bidder's and target's stockholders to earn an excess return as a result of the merger are substantially limited.

Previous studies suggest that cost-efficiency could be improved by joining complementary, adjacent and/or small network operations or by replacing municipal ownership with private. According to some authors, gathering generation, supply and distribution functions to the same entity would create synergies. Switching to private ownership would not necessarily

guarantee efficiency gains as studies report mixed results on efficiency differences between municipal and private distributors.

A municipality may use its electricity utility revenues to substitute taxes or to subsidize the local community with low prices. To maximize political support, politicians may not want to charge residential and commercial customers high fees. On the other hand, maintaining low utility fees might result to higher tax rate. Most Finnish utilities have chosen the latter approach, at least to some extent. Regardless of the form of a utility's contribution to the economy of a municipality, there is associated risk related to the partly competitive business.

Due to private utilities' profit-orientation the first hypothesis is:

> *Hypothesis I: Electricity distribution price increases due to change of ownership from municipal to private.*

Pricing may only be adjusted within the limits set by the regulation scheme. According to the statistics and research on the sector, the price changes have been modest on average and the sector has already been operating at a profit. Increase in efficiency, however, may have occurred. Therefore, the following hypothesis is set regarding a municipality that has sold its utility shares:

> *Hypothesis IIa: Present value of cost incurred from post-take over price change is smaller than present value of selling proceeds.*

Even if a municipality owned utility distributes dividends, it is assumed that the owners would not maximize the tariffs to avoid political hazards. Thus the dividends would not be as high as a company operating on pure commercial basis would have. Given the assumption that there has been a competition between bidders of the regional utilities the purchase price of the shares has been the prevailing market price. This provides a basis for the third hypothesis:

> *Hypothesis IIb: The sum of present value of cost incurred from post-take over price change and present value of opportunity cost from losing the prevailing dividend payments is smaller than present value of selling proceeds.*

Part III – Empirical Study

6 Methodology

The purpose of the Empirical study is to analyze selected Finnish electricity utility merger cases utilizing the theoretical concepts introduced in the previous sections. First, the study analyses whether distribution prices of a municipally owned electricity utility have increased in connection with a merger. Second, this part inspects what kind of impacts on a municipality's economy result from electricity utility share sale. The study investigates eight case companies regarding the first issue and six case companies regarding the second on the basis of EMA price statistics.

This section presents the methodology used in the Empirical study, its parameters and sensitivity analysis scenarios. First, the post-takeover price changes are assessed against a selected benchmark that would represent the outcome of a municipal company's pricing. The methodology related to pricing assessment is presented in more detail in Section 6.1. Second, Section 6.2 defines the factors affecting a municipality's economy after the takeover: higher distribution cost, dividends and selling proceeds. Lastly, sensitivity analysis scenarios and the related parameters are described in Section 6.3.

6.1 Takeover related price change

Only the distribution part of the total electricity price paid by a consumer is analyzed in the Empirical study. Price increases (decreases) decided by the new management are detectable in distribution business as the effect of competition or the volatile wholesale price is absent unlike in retail sales business. In retail market, one can choose the preferred supplier and therefore the price level faced by a consumer is to a large extent independent from the acquisition. In the analysis, prices for ten consumer types are studied and assessed against benchmark prices.

6.1.1 Price categories

As far as the pricing analysis is concerned, harmonized distribution prices published by EMA are taken as a basis. The final electricity distribution price faced by a consumer consists of energy fee (€/MWh), capacity fee (€/MW) and fixed fee (€/month), which vary depending on the consumer type. Flats, single houses and industry, for example, have different combination of the fees depending on the required voltage level. To increase visibility and enable

comparison of the prices, EMA has formed ten standardized consumer types. Average price for the consumer types are published in the form of energy fee by dividing all payments for electricity distribution by electricity consumption. Consumer types defined by the EMA and the corresponding average price in Finland in November 2007 are listed in Table 7.

Table 7. Consumer types used in analysis and consumer prices in November 2007 (EMA, 2008c)

Type of consumer	Description	Average price November 2007 (c/kWh)
K1	Flat, fuse 1x25 A, consumption 2 000 kWh/year	5.99
K2	Single house, fuse 3x25 A, consumption 5 000 kWh/year	5.14
M1	Agriculture, fuse 3x35 A, consumption 10 000 kWh/year	3.66
M2	Agriculture, fuse 3x35 A, consumption 35 000 kWh/year	3.28
L1	Single house with direct electric heating, fuse 3x25 A, consumption 18 000 kWh/year	4.89
L2	Single house with partly accumulating electric heating, fuse 3x25 A, consumption 20 000 kWh/year	3.63
T1	Small-scale industry, consumption 150 000 kWh/year, demand 75 kW	3.08
T2	Small-scale industry, consumption 600 000 kWh/year, demand 200 kW	2.74
T3	Medium-scale industry, consumption 2 000 000 kWh/year, demand 500 kW	2.09
T4	Medium-scale industry, consumption 10 000 000 kWh/year, demand 2 500 kW	2.01

For the purpose of the analysis, electricity prices are recorded annually and from the year end prices. Thus, the pre-takeover price is the price of the last December before the takeover. The annualizing provides adequate accuracy since the prices are rarely changed during the year. As exception, year 1998 price is estimated by using January 1999 price, because the company specific price statistics start from 1999.

6.1.2 Price benchmarks

In order to detect differences in pre- and post-takeover pricing, price benchmarks are created. The natural choice for a benchmark is the weighted average price of all Finnish companies, published by the EMA. The prices of each company are weighted with the amount of distributed electricity. This benchmark well illustrates the price paid by an electricity consumer on average and thus it is used as the base case benchmark in this analysis. However, it gathers the effects of different pricing policies of rural, regional, investor-owned and city utilities. Thus, it is not the most effective benchmark for studying pricing of previously municipally owned distributors.

A benchmark that would mimic behaviour of a municipal utility is a company with similar non-profit orientated pricing policy and consumer structure. By using this benchmark, the effect of different cost levels related to certain geographical areas or company structure are

minimized. It has been noticed that distribution costs vary between companies and countries due to structural differences (Kinnunen, 2004; Jamasb & Pollitt, 2003).

When benchmarks are applied, only the proportional changes are analyzed. This diminishes the effect of absolute price level to some extent. In addition to the acquisition cases, the following companies' pricing is analyzed and used as a benchmark:

- Suur-Savon Sähkö Oy
- Kymen Sähköverkko Oy
- Pohjois-Karjalan Sähkö Oy
- Keravan Energia

The first three companies belong to the same electricity procurement and marketing alliance, Kymppivoima, and have distribution business approximately of the same magnitude (annual volume 1 100-1 300 GWh). Furthermore, they have been under municipal ownership through their existence. Suur-Savon Sähkö Oy, Kymen Sähköverkko Oy, Pohjois-Karjalan Sähkö Oy are the 6th, 7th and 10th largest distributors, respectively, in terms of distribution turnover in Finland.

Keravan Energia is included to represent low price scenario. However, it must be noted that its network is located in densely populated area and thus its pricing is not totally compatible with the regional companies.

6.2 Financial implications of share sale

Based on the findings of the Literature review, value of a municipal electricity utility lies in its contributions to the community. Hence, the value of the utility stocks held by a municipality is the present value of the future contributions. When the company is acquired, the contributions are lost as the new owner holds the shares and is expected to adjust the prices to the profit maximizing level.

There are two ways the utility can contribute its owners. In case the company makes zero profit and keeps the prices below the allowed level defined by the regulator, the stock value is measured only against the difference between the municipal distribution charge and the profit-maximizing charge. Hereafter this difference is denoted as *delta cost*. Thus, value of the shares is present value of the future delta cost. Should the utility maximize dividend payouts

to its municipal owners, the value of the shares is present value of the future dividends. The case utilities have used combinations of the two aforementioned contribution policies.

The opportunity cost for losing the contributions is compensated with a lump sum of cash or shares in acquiring company in case the utility shares are sold. This compensation is hereafter denoted as *proceeds* or *selling proceeds*. In this study, it is assumed that a utility's total contribution to its owner municipality's economy only consists of a combination of delta cost and dividends. Given this assumption, the economy of a municipality does not deteriorate after share sale if the following equation holds:

$$PV(proceeds) \geq PV(delta\ cost) + PV(dividends) \quad (2)$$

Given only the above-mentioned forms of contribution and means of payment for the shares, one can measure the *net gain* resulting from the share sale:

$$Net\ Gain = PV(proceeds) - PV(delta\ cost) - PV(dividends) \quad (3)$$

One must note that there are other forms of contributions a utility may give to the owner. The utility pays taxes, which are returned to the local administration via government taxation. However, for a municipality controlled firm, it would be tax effective not to collect profits if the choice between dividends and cheap electricity is otherwise indifferent. In addition, district heating pricing may also be under profit-maximizing level and serve as a contribution.

There are also factors related to proceeds and contribution items that are very difficult to quantify. One form of contribution is the quality of supply which may be subject to change after the takeover. Moreover, a promise of reciprocal service procurement or of increase of employment in the area may be a means of compensation to the selling municipal owner. However, these factors are out of scope of this analysis.

The main assumptions in the analysis are related to stability of distribution pricing under municipal ownership and stability of the contribution level. First, it is assumed that the distributors have their pricing at a sustainable level; they are able to operate the company without making a loss. All of the studied companies' distribution businesses were more or less profitable at the time of the takeover and could subsidize the electricity retail sales business reaching positive net result in the group level. Second assumption is that the

municipally owned companies would continue their business on an "as is" basis keeping their profit level and associated pricing policy as it is.

The variables in Equation 2 are defined more in detail in the next sections. First, the components of delta cost are determined and the associated assumptions are described. Second, the treatment of dividends in the equation is explained. Finally, conversion of the contribution items, delta cost and dividends, to present values is presented.

6.2.1 Delta cost

A key component in the analysis is the change in distribution cost to the previous owners, the delta cost. It can be seen as the opportunity cost for the municipality when assessing a share sale. The cost depends on electricity consumption in the area, consumer type distribution and pricing. With simulated benchmark pricing, this analysis is to value the differences between pre-takeover and post-takeover prices that are not related to overall cost changes or regulation. A municipality owned distributor would probably react to overall cost changes but would not charge for its inhabitant price that maximizes the reasonable return.

The simulated benchmark price is based on the actual pre-takeover price level and annual relative changes. The pre-takeover price is taken as the basis on which the price trajectory is developed. The simulated price is adjusted annually with the relative change in the benchmark price. Without knowledge of the national average price for years 1995-1996 and other benchmark prices for years 1995-1998, prices are assumed to remain unchanged or to follow national benchmark during the time period in question. Simulated base case prices are shown in Appendix B.

When the prices are coupled with electricity consumption data, the impact of price changes can be studied. The delta cost for a municipality is calculated with Equation 4:

$$\Delta_i = (P_{AHi} - P_{BHi}) \cdot C_{AH_i} + (P_{AAi} - P_{BAi}) \cdot C_{AA_i} + (P_{ASi} - P_{BSi}) \cdot C_{AS_i} + (P_{AIi} - P_{BIi}) \cdot C_{AI_i} \quad (4)$$

where

P_{AHi} = *Post-acquisition household (H) consumer price in year i*

P_{BHi} = *Benchmark household (H) consumer price in year i*

C_{AHi} = *Electricity consumption of household (H) consumers in year i*

As already seen in the aforementioned equation, the consumers of each municipality are divided into four categories: households, agriculture, services and industry. This breakdown

integrates the consumption data with five consumer categories (households, agriculture, public services, private services and industry) with price data including ten categories (see Table 7 in Section 6.1.1). The ten pricing categories and the five consumption categories are harmonized in the following way:

Households (H)= Average(K1,K2,L1,L2)

Agriculture (A)=Average(M1,M2)

Private and public services (S)= T1

Industry (I)=Average(T2,T3,T4)

The integration may create inaccuracy to the results since the actual delivered volume to the consumer categories K1-T4 is unknown. There is a notable difference between prices of different household consumers, for example between T1 (flat) and L1 (single house with electrical heating). Thus, averaging may not yield true cost of household consumption in the area of a municipality. In addition, structural change in consumption pattern may cause discrepancies between the modelled and actual distribution cost.

The whole electricity need of a municipality is assumed to be supplied by a single company. The areas of responsibility of the network operators follow the municipality borders quite accurately, although some exceptions exist. The local distributor's pricing is applied to all consumption according to the assumption.

Adjustments are made to the actual consumption regarding industry category and all categories after year 2004. Should heavy industry operate in the area of a municipality, industry consumption category is excluded. Paper and steel mills, for example, generate their own energy or receive it directly from the national grid. Municipality specific consumption data is available only until 2004 and therefore the years' 2005-2007 consumption is estimated by applying growth rate of national electricity consumption.

Some of the selected acquisitions took place before 1999 and therefore actual price history cannot be extracted. In these cases, prices are simulated for the first years based on the results regarding pricing around the merger year. This methodology, naturally, may lead to inaccurate results in the particular cases but gives an estimate of the overall effect. After all, pricing of all the three acquiring firms, IVO (Fortum), Vattenfall and Graninge (E.ON), is expected to follow the same profit-maximizing principles and therefore applying an estimate of the post takeover pricing provides adequately accurate results for this analysis.

The price difference to benchmark is assumed to grow at long-term expected inflation rate after 2007. The perpetual real difference is calculated as three year average taking into account the years 2005-2007. This method captures the price adjustments over one regulatory period and gives an estimate of the sustainable pricing level. According to Finland's central bank (Bank of Finland, 2008), consumer prices are expected to increase by 2.0% in 2010 which is the last forecast year of the bank. Based on this forecast, the price difference is assumed to grow at a rate of 2.0% in the empirical model.

6.2.2 Dividends

Some of the case companies have paid dividends, whereas some have chosen to distribute profits in the form of cheap electricity. The actual dividends have been included in the analysis when available. An alternative where no dividends are paid is also investigated.

If the company have paid dividends, actual dividends are assumed to grow at a predetermined rate after the takeover. The base case is that the dividends would increase slightly in real terms, which would assume that the pricing is kept at a low level relative to the allowed maximum. The dividend growth percentage is taken as an average of the other large regional electricity utilities' dividend growth percentage (see Table 8).

Table 8. Dividend growth rates of benchmark companies

Company	Dividend growth rate (compound annual growth rate)	Period
Suur-Savon Sähkö	3.7 %	2003-2007
Savon Voima	4.2 %	2003-2007
Pohjois-Karjalan Sähkö	0.6 %	2003-2006
Kymenlaakson Sähkö	2.9 %	2003-2006
Average	**2.9 %**	

Growth rates are based on information obtained from financial statements of the companies.

Other forms of monetary profit distribution are omitted from the analysis. Interest on subordinated loan from shareholders, taxes and fees paid to the owner of a utility are ignored. Some municipalities charge the utilities environmental protection taxes and fees, which are actually means of tax-free profit collection (Teijonsalo, 2008). Municipalities that accommodate the distribution companies' facilities may collect tax from the company in addition to the dividends.

6.2.3 Discount rate

The previous sections explained how the contributions are converted into cash flows or opportunity cost cash flows (delta cost). The cash flows are assumed to occur in the end of the year. In order to calculate the present value of these cash flows a discount rate appropriate for the particular business is determined.

In theory, shares should be valued by using expected return on similar risky asset as the discount rate (see e.g. Brealey & Myers, 2003). The EMA has determined cost of capital for distribution activities. It is used as the reasonable return on the regulatory asset base. EMA calculates reasonable return on equity in the following way:

$$r_e = \beta_l \cdot (r_m - r_f) + r_f + IL \qquad (5)$$

where

β_l= *levered beta*

r_m-r_f= *risk premium*

r_f= *risk-free rate*

IL= illiquidity premium

In this analysis it is assumed that the base parameters, the asset beta and risk premiums, have remained the same from the beginning of the calculation period. Only the risk-free rate is adjusted year-by-year. The parameters for determining cost of capital for 2008 in regulatory accounting are shown in Table 9. The formula for calculating weighted average cost of capital (WACC) is presented in Appendix D.

Table 9. Parameters for determining reasonable revenue for invested capital in electricity distribution assets for 2008 (EMA, 2007b)

Parameter	Private companies
Risk-free base rate	4.33 %
Risk premium	5 %
Illiquidity premium	0.20 %
Unlevered beta	0.3
Levered beta	0.395
Tax rate	26 %
Debt of total assets	30 %
Premium on debt	0.60 %
After tax WACC	**5.65 %**

The formula for calculating weighted average cost of capital (WACC) is presented in Appendix D.

Given the owners' approach to risk-taking, one might argue that the alternative investment a municipality would switch into after share sale would not include that high risk. According to information on the municipalities' investments, the actual returns on proceeds from selling electricity utility shares have varied significantly. The municipality of Rantsila's proceeds from the sale of Revon Sähkö grew by 7.5% in 2006, whereas the 10-year government bond yield was only 3.8% on average in the same year. The city of Espoo, on the other hand, managed to get only 0.13% return on its energy company selling proceeds in 2007. That year the same bond yield was 4.3%. The city of Helsinki reported 4% return for all of its investments in 2007, which represented the yield of low risk money market instruments.

Some of the municipalities have paid back their loans or just improved service level and thus their money has generated returns less than risk-free government bond yield or returns that cannot be measured. Often the proceeds have been directed for both investing and spending purposes. For instance, the former owners of Keski-Suomen Valo set up a fund to invest into regional small enterprises.

Not in all cases the purchase price is paid in cash, but in shares of the merged company. In return for shares of Jyllinkosken Sähkö, Lounais-Suomen Sähkö offered stocks in the new company. As a result of this, the cities of Kurikka and Kauhajoki had a huge amount of capital invested in the shares of two companies, Fortum and Neste Oil in the beginning of 2008. In these cases, the risk of the original investment has even increased as the regional distributor was merged into a company that has expanded its business outside Finland. However, in these cases, market value of the listed stocks is, by definition, set by the market.

Due to the various views on opportunity costs and wide range of returns gained by the municipalities, EMA cost of equity adjusted with prevailing risk-free rate is used as the base parameter in the analysis. The past years cash flows have been discounted with the realized rate, whereas future cash flows are discounted with the rate of 2008.

6.3 Sensitivity analysis parameters

Sensitivity analysis is conducted in order to examine the effects of varying the assumptions on which the model is specified. Changes are made in the model, one change at a time. Alternative parameters are tested for the most important and uncertain parameters: price benchmark, realized electricity price, discount rate, household electricity consumption distribution, and dividend growth rate.

6.3.1 Price benchmark

According to the base case assumption, the regional utilities' price would have followed development of the national average price if the ownership had not changed. The chosen low case, Keravan Energia -pricing, represents a possible price trend that is almost flat and even decreasing, in real terms. Despite the flat prices, applying this scenario does not necessary deteriorate the business' profitability, if the starting level has been sufficiently high.

High case follows the regional company Suur-Savon Sähkö's price trend. The company has increased its prices clearly more than the other large regional companies. Moreover, the company has not gone through any corporate restructurings that would have forced it to increase (decrease) prices. Annual changes of alternative benchmark prices are shown in Appendix C.

6.3.2 Electricity retail price

Even though the retail electricity market is de-regulated, the consumers are very reluctant to change supplier. Annual churn is roughly 5% in retail market (Teijonsalo, 2008). As stated above in Section 2.1.3, the retail business has been severely loss-making business which implies that most of the utilities tend to charge prices lower than average wholesale price. Some companies offer their local customers lower price than they offer to other Finnish customers. Assuming that this situation continues after the acquisition, there is a possibility to increase prices without losing any customers.

This possibility's impact is investigated by increasing the electricity price by 5% after the acquisition. One must note that there is a strong underlying assumption implying that the unprofitable retail sales business would have continued under municipal ownership and that the customers would not change their supplier in case price increases above competitors' rates.

6.3.3 Discount rate

Sensitivity analysis on discount rate is only applied to the realized and perpetual delta costs and to selling proceeds. The low case rate represents the risk-free return for municipal funds, yield of 5-year government bond. Investment into this security fully complies with the objectives of municipal investing. The yield has fluctuated between 2.9% and 8.4% in 1998-2007 and the average in 2007 was 4.2%. Should a municipality spend the money mostly on consumption, the low case rate could be close to zero. However, this would be highly

hypothetical situation, given the large amounts of cash the municipalities received when selling the shares.

The high case values the delta cost with flat rate of 7.5%, which was the yield for the Revon Sähkö selling proceeds received by the municipality of Rantsila in 2006. Naturally, a municipality changes its risk position in the analysis when the alternative parameters are applied, but the loss or gain from the new risk-return position is not valued. Appendix C shows the discount rates applied in the sensitivity analysis.

6.3.4 Electricity consumption

As discussed earlier, estimating consumption structure of the household segment by uniform distribution may distort the results to some extent. For instance, the consumption of flat households may not be 25% of the total segment's consumption in every municipality. The magnitude of this effect is tested by increasing (decreasing) the household consumers' price by 25%, which will then move the weighted average price towards the highest (lowest) household price.

6.3.5 Dividend growth rate

Dividend growth rate is derived from the comparable companies' data. Although the acquired regional companies should resemble the benchmark companies, some differences between the utilities' business environment may exist. If the companies' business was purely based on distribution operations, the regulation would limit the maximum profit and thus their development of profitability would be identical in the long run. However, heat business and electricity generation may break the link between distribution regulation and profitability. Thus dividend growth rate is varied in the analysis by +/- 1 percentage point.

7 Case acquisitions

The cases include takeovers of municipality owned electricity utilities occurred in 1994-2007. The total sample includes ten takeovers which are divided into two groups. The first and larger group is used in the pricing analysis. The second group is analyzed from the perspective of share sale and its impact on the municipalities' economy. The takeover processes have been well documented since they have gained a lot of publicity in the media.

Information to the Empirical study is retrieved from various sources. Descriptions of the transactions are gathered from newspapers: Helsingin Sanomat, Kauppalehti, Taloussanomat and Tekniikka & Talous. Detailed ownership shares and other company information are obtained from newspaper articles, annual reports, municipal memorandums and private communication with specialists. Data regarding pricing and consumption are obtained from the Electricity Market Authority (EMA) and from Association of Finnish Energy Industries. Other information related to distribution activities of the companies are acquired from energy statistics provider, Adato Energia Oy.

Descriptions of the cases, acquiring and benchmark companies and the principles of the case selection process are provided in the next sections. The first two sections describe the two subsamples and the screening criteria. To enable discussion on takeover rationale, the bidders are presented. Finally, benchmark companies are introduced briefly.

7.1 Distribution pricing sample

The sample for studying changes in distribution pricing around the merger year includes the price data of all the electricity utilities that were targets of takeovers after 1998. Prior to 1999, company-specific pricing data has not been gathered and harmonized by the EMA. As far as this sample is concerned, there are no restrictions on the allowed business portfolio of the targets. However, the sample includes only the cases where majority of the shares moved from municipality or municipalities to a private owner. The data includes price history of all the consumer categories from K1 to T4. Prices of the following companies are included in the sample (year of takeover in parentheses):

- Revon Sähkö Oy (1999)
- Heinola Energia Oy (1999)
- Keski-Suomen Valo Oy (2000)
- Hämeenlinnan Energia Oy (2000)

- Joensuun Energia Oy (2001)
- Espoon Sähkö Oyj (2001)
- Kainuun Sähkö Oy (2002, majority stake)

7.2 Case companies

The cases analyzed in the second part of the Empirical study include takeovers before and after 1999. The case acquisitions belong to the second wave of electricity utility mergers in Finland (see Section 2.1.3), when IVO (now Fortum), Vattenfall and Graninge (now E.ON) acquired large regional companies which were co-owned by several municipalities. The following criteria were used for selection of the case target companies:

- the target did not have major power or heat generation assets
- more than 50% of the shares were acquired in the deal
- majority of the target was owned by several municipalities
- owner municipalities' inhabitants and enterprises were invoiced for the target's electricity distribution services

The criteria are selected in order to isolate the interrelation of utility contributions (pricing and dividends) and the acquisition price (selling proceeds) from other factors. The first selection criterion excludes companies that had major heat sales or power generation, since these activities' contributions to the community are ambiguous and they break the direct link between acquisition price and collectable distribution charges. There is no clear market price or regulation for heating business and change in heat price does not concern all the inhabitants, since all are not supplied with district heat. Thus, including targets that had district heating activities would have impeded interpretation of the results.

The second and third criteria's function is to include acquisitions which transferred control of the company to the new owner that has had distinct pricing policy from the previous ones. With majority share of the company, the new owner could control the pricing in the areas of the municipalities. After applying the criteria to all takeovers in 1995-2007, the total number of relevant acquisition cases is six (year of the acquisition in parentheses):

- Jyllinkosken Sähkö Oy (1995)
- Lapuan Sähkö Oy (1995)
- Hämeen Sähkö Oy (1995)
- Revon Sähkö Oy (1999)
- Keski-Suomen Valo Oy (2000)
- Kainuun Sähkö Oy (2002, majority stake)

In terms of turnover, the companies were among the largest in Finland before the takeover and had a large ownership base. The case companies had over 80 municipal owners together, but only 73 of them are included in the analysis. The exclusion was made on the basis of information availability. The companies were mainly pure electricity utilities but some of them had minor district heating operations and power generation as well. The deal descriptions and key operational figures are presented in the following table.

Table 10. Key information on case acquisitions

Target	Bidder	Acquired share	Year	Acquisition price (M€)	Turnover (M€)	Electricity sales (GWh)	El. customers (pcs)	Municipal owners (pcs)	Share of other owners[2]
Lapuan Sähkö	Vattenfall	100 %	1995	42	18	273	20 771	6	n/a
Jyllinkosken Sähkö	LOSU[1]	100 %	1995	71	37	710	52 274	4	46 %
Hämeen Sähkö Oy	Vattenfall	100 %	1995	160	115	2 000	150 000	n/a	40 %
Kainuun Sähkö	Graninge	74 %	1997/2002	84	48	1 027	50 000	11	2 %
Revon Sähkö Oy	Vattenfall	100 %	1999	136	36	620	43 000	20	0 %
Keski-Suomen Valo Oy	Vattenfall	100 %	2000	178	54	925	74 600	22	0 %

[1]Lounais-Suomen Sähkö Oy.
[2]Private owners or companies and foundations that are not controlled by municipalities.
Company information is from the last year before takeover.

The following sections provide brief description of the targets. The pre-takeover operations, ownership and the takeover process are described. Development of profitability or operations cannot be tracked after the merger, except in the case of Kainuun Sähkö (now Kainuun Energia). The cases are introduced in chronological order and more detailed descriptions are provided of the most recent cases. Owners of the companies included in the analysis are presented in Appendix A.

7.2.1 Jyllinkosken Sähkö Oy

Jyllinkosken Sähkö was one of the largest electricity companies in Ostrobothnia selling 700 GWh of electricity annually and serving over 50 000 customers. The company was to merge with the adjacent municipal co-owned utility, but arrived at being a part of Fortum Oyj.

In December 1994, a consortium of four owners had agreed not to sell the shares of their local electricity supplier. The agreement was to prevent possible takeover attempts. Originally, Lapuan Sähkö, electricity utility of the city of Seinäjoki, and Jyllinkosken Sähkö were supposed to merge and form so-called "Energia-Botnia", but the project was terminated by the administration of Seinäjoki. Soon after that, Vattenfall succeeded in acquiring Lapuan Sähkö Oy in 1995.

Lounais-Suomen Sähkö Oy acquired the majority of Jyllinkosken Sähkö Oy in April 1995 with four different share deals. The cities of Kurikka, Närpiö and Kauhajoki and Etelä-Pohjanmaan Alueverkko Oy sold the shares in this phase and later the municipality of Ilmajoki agreed to sell its stake. Vattenfall had bought one third of the company earlier, but was now forced to sell its stake. The acquisition price totalled €71 million.

Kurikka, Närpiö and Kauhajoki received shares of the new company, Lounais-Suomen Sähkö Oy, instead of cash in the transaction. Mergers and demergers in the following years resulted in a situation where the three municipalities owned relatively large amount of shares in Fortum, one of the leading energy utility in Northern Europe, and oil refining company Neste Oil. In the beginning of 2008, the city of Kurikka was the fourth largest owner of Fortum and sixth largest owner of Neste Oil (Fortum, 2007; Neste Oil, 2007).

The market value and annual dividend payment of the shares owned by the municipalities is enormous compared to the size of the annual budgets. Kurikka's shares were worth about €176 million and the city received €9.2 million in dividends in 2007. The annual tax revenue of the city was €22.5 million and cost budget €45 million in the same year. This additional revenue has allowed the city to decrease its tax rate to the lowest level in the province. Kauhajoki's annual €1.5 million cash from dividends has been a substantial addition to its €30 million tax revenues.

7.2.2 Lapuan Sähkö Oy

Turnover of Lapuan Sähkö Oy was about €18 million and the company distributed about 400 GWh of electricity annually in Southern Ostrobothnia in the mid-1990s. The company was clearly smaller than the other acquired regional utilities. As was discussed in the previous section, Vattenfall proceeded rapidly with Lapuan Sähkö after failing to acquire Jyllinkosken Sähkö.

Vattenfall acquired the company with €45 million, which was considered high at that time. According to the company, substantial power generation assets justified the price. Press argued that the true reason behind the price was the large potential for cost-cutting, especially related to personnel expenses. Others rationalized the high price with vertical integration gains. Furthermore, Lapuan Sähkö owned a significant sawmill business as well which may have been one of the explanations for the relatively high acquisition price.

7.2.3 Hämeen Sähkö Oy

Hämeen Sähkö was clearly the largest takeover target of Vattenfall. The company had some 140 000 customers and delivered almost 2 TWh of electricity in its large geographical area in the province of Häme. It was the second largest Finnish electricity distributor after Helsingin Energia in 1995. At that time, electricity business accounted for 92% of the company's €115 million turnover. After losing the competition for Jyllinkosken Sähkö, Vattenfall acquired Hämeen Sähkö in the same year as Lapuan Sähkö, in 1995.

The €160 million paid by Vattenfall contributed economies of over 15 owner municipalities. The deal was the largest in the sector in terms of acquisition price in the 1990s. The city of Hämeenlinna had the largest share of the company with its 8.4% stake. In addition to the Hämeen Sähkö shares, Hämeenlinna had its own city utility Hämeenlinnan Energia, which was sold to Vattenfall later as well. One of the former municipal owners, Kuhmoinen, set up two funds around the €4.7 million selling proceeds. The funds' capital was to be invested into enterprises with production activities with approval of the local council.

7.2.4 Revon Sähkö Oy

Revon Sähkö Oy was a significant electricity distributor and supplier operating in Northern Ostrobothnia. In 1998, a year before merger with Vattenfall, the company had annual turnover of €59 million. The distribution business accounted for 52% of total sales with volume of 650 GWh per annum. The other half of the revenue was derived from the electricity sales. The power and heat generation volumes were very small compared to those of sales and distribution divisions.

The company's distribution business was a source of revenue for 20 municipal owners. The sales division was making a loss, typical of the electricity retail sales business. In spite of that, the company distributed annual dividends (75% of net profit in 1998) and thus was not exercising complete subsidy policy in the area of its owner municipalities. However, the owners were supposedly not satisfied with their shareholding as they invited tenders for the company after noticing large utilities' interest in mergers.

Since the opening of the electricity market in 1995, Vattenfall had expressed willingness to acquire more electricity utilities in addition to Lapuan Sähkö and Hämeen Sähkö. In 1996, the owner municipalities of Revon Sähkö decided to launch a bidding competition, in which Vattenfall took part among four other companies. Although the sales process of the company

did not proceed further this time, Vattenfall continued persuading the owners to sell their stake.

Not until 1998, Vattenfall had won over some of the financially weakest municipalities. The municipality of Pyhäjärvi, for example, had unemployment rate of roughly 20% and needed funds to cover its financing deficits. Only eight municipalities were reluctant to sell and wanted to continue developing their regional energy utility. A bid that was considered high at that time finally went through in 1999.

Vattenfall paid €136 million for the company and offered additional compensation in the form of environmental conservation programs. Vattenfall promised to spend some €80 000 in water conservation per annum. However, five years after closing the deal Vattenfall was accused of failing to contribute this much to the conservation programs. In spite of this negative affair, the cash payment has been welcomed by many municipalities.

Some of the municipalities invested the proceeds in local business to increase employment and some invested in different funds and used only the annual returns for spending. For example, 8 000 inhabitants' Oulainen invested its €11 million in low risk securities, for example in government bonds. Municipal bulletin Pylkönposti wrote that without the selling proceeds from Vattenfall, the municipality would have been in financial distress (Municipality of Pylkönmäki, 2007).

7.2.5 Keski-Suomen Valo Oy

Keski-Suomen Valo Oy was the second largest Finnish acquisition target of Vattenfall. The company distributed over 900 GWh of electricity and had annual turnover of over €50 million before it was merged into Vattenfall. It was owned by 22 municipalities, but its network covered area of 33 municipalities. Magnitude of own electricity generation was small, accounting only for one fourth of the total sales volume. Profitability of the company had been poor; return on equity had declined four years in a row to a level of 0.4% before the merger that took place in 2000. The profitability level can be explained, to a large extent, with the regional subsidy policy of the company.

In 1997, the company's board of directors decided to continue with the non-profit strategy. The company was officially pursuing non-profit pricing policy and contributed its owner municipalities with low electricity prices. The company distributed dividends hardly at all at

that time. Due to history of undercharging, utility pricing was a sensitive issue when the owners decided to close the deal with Vattenfall in 2000.

By offering €178 million, Vattenfall went ahead of Fortum in the bidding contest and took over the company in two phases by December 2000. As the other regional companies, Keski-Suomen Valo had redemption clauses in the articles of association, which did not prevent the company from being taken over in this case. According to newspapers, Vattenfall promised not to increase prices or lay off personnel due to reasons related to the deal. In addition, Vattenfall promoted its business ethics by referring to Hämeen Sähkö's post-acquisition price development. Hämeen Sähkö's customer prices had decreased in the beginning of 1999, four years after the merger to Vattenfall.

Significant proportion of the selling proceeds was invested in the region's enterprises. The city of Jyväskylä and the municipality of Karstula established their own regional development companies that regularly invested in small businesses. Seven other municipalities invested in total €3.3 million in Midinvest KSV Fund, which then invested the capital to companies operating in the region. Some of the cash was allocated to a company responsible of regional development, Jyväskylänseudun kehittämisyhtiö Oy. The municipality of Laukaa put some €900 000 into that firm.

7.2.6 Kainuun Sähkö Oy

Kainuun Sähkö Oy supplied electricity to 50 000 customers in the province of Kainuu in the beginning of the millennium. With volume of 625 GWh, the company derived 30% of the total sales from distribution business in 1996. The company's own power generation capacity was small, but it had significant participations in co-owned generation companies. Most importantly, Kainuun Sähkö had started to explicitly apply profit-orientated business practise.

The owners set profit targets and decided to begin steady dividend distributions starting from 1996. Return on capital employed increased 5.2 percentage units to 8.1% in 1995. In addition, the articles of association were amended, which removed obstacles to share sales. However, obligation to redeem was set for owners who acquired one third of the shares.

In 1997, another Swedish energy firm, Graninge (Graningeverkens AB) entered the Finnish market by acquiring one fourth of Kainuun Sähkö Oy. Five municipalities sold their shares after multiphase negotiations. The selling municipalities initiated the negotiations, because

they did not want to own that large stake in a low profit energy business. Graninge also joined the bidding contest for Revon Sähkö Oy, which had adjacent distribution network to Kainuun Sähkö. Vattenfall eventually won the contest and Graninge ended up increasing its ownership in Kainuun Sähkö in 2002.

In January 2002, three municipalities sold their shares to Graninge, which then owned 50.5% of the company. The remaining municipal shareholders were the cities of Kajaani (37.5%) and Sotkamo (12.0%). Return on equity has increased from 3.2% in 2001 to 11.5% in 2005. The company has gone through some restructurings and at the same time personnel of the total group has been reduced by two thirds from 2001.

7.3 Peer group for case companies

The benchmark companies are included in the analysis to illustrate an alternative and fictional development of the acquired utilities. Had the utilities stayed under municipal ownership, they would most likely resemble the benchmark companies of today. Many of the acquired and the benchmark companies had a common denominator; they belonged to the electricity marketing and procurement consortium, Kymppivoima. Most importantly, all of the companies were significant players in the Finnish electricity market.

Today, only few regional and large electricity utilities that were not acquired by Fortum, Vattenfall or E.ON are left. These companies are: Suur-Savon Sähkö Oy, Savon Voima Oyj, Kymenlaakson Sähkö Oy and Pohjois-Karjalan Sähkö Oy. All of these companies are among the ten largest Finnish electricity utilities in terms of distribution volume and turnover (see Table 11). Savon Voima is by far the largest of them.

Table 11. Regional electricity utilities' key figures in 2006

Company	Group Turnover	Operating profit		Distributed energy	Distribution customers	Owner municipalities	Other owners[1]
	M€	M€		GWh	pcs	pcs	% of total
Savon Voima Oyj	198.9	27.8	14 %	1 722	105 413	25	0 %
Suur-Savon Sähkö Oy	91.5	16.2	18 %	1 150	94 653	24	10 %
Kymenlaakson Sähkö Oy	88.7	14.5	16 %	1 340	98 515	18	0 %
Pohjois-Karjalan Sähkö	86.8	10.8	12 %	1 114	84 077	22	0.6 %

[1]Private owners or companies and foundations that are not controlled by municipalities
Data is obtained from annual reports and financial statements

The three major private utilities have eyed these companies. For example, Vattenfall negotiated with owners of Savon Voima and Suur-Savon Sähkö in order to acquire the

companies. The negotiations were unsuccessful and the owners' decision not to sell the shares was subsequently backed up by takeover defence mechanisms.

Savon Voima restructured its ownership to maintain the municipalities' control of the company in the late 1990s. 55% of the shares were moved to Savon Energiaholding Oy and sealed from takeover candidates with clauses in articles of association. The holding company had a first refusal right for the shares and the municipalities secondary. A consent clause was also included in the articles of association.

The rest of the company, 45% share, was sold to TXU Finland Holdings Ltd in two occasions, in 1998 and 2002. Both of the owners, Savon Energiaholding and TXU, now owned newly established Atro Oyj, the parent company of the Savon Voima energy business. The co-ownership ended when TXU Europe, a subsidiary of British American energy utility, had to dispose its 45% stake in Atro Oyj to Savon Energiaholding Oy for €57 million, since it went into administration in November 2002.

Suur-Savon Sähkö anchored its ownership to the region with redemption clauses and by establishing a foundation to be the company's major owner. Management and owners of Suur-Savon Sähkö Oy formed a foundation that held 24 % of the shares and voting power being the largest single shareholder. The redemption clause, on the other hand, ensured for other municipality owners a pre-emptive right to buy the shares in case they were about to change owner. Previously, the redemption price for the shares was derived from the book value of equity resulting in practically zero share value. This prevented the owners from selling the shares as they were worthless if sold.

Kymenlaakson Sähkö Oy has not been publicly negotiating about merger with the large utilities probably due to its strong municipal ownership. Its defence against takeovers has been the clause in the articles of association stating that no other investors than municipalities are allowed to hold the shares of the company. Furthermore, it has had redemption clause forcing a potential takeover candidate to buy all the shares if the ownership exceeds certain limit. Until 2003, the company's articles of association prevented it to distribute any dividends.

Pohjois-Karjalan Sähkö Oy, the smallest of the regional Kymppivoima companies, has also managed to avoid serious takeover attempts. Its ownership is structured in the same manner as in Savon Voima. 54% of the company is owned by Pohjois-Karjalan Energiaholding Oy,

which has tied its municipality owners to the company with special clauses in the articles of association. The company has first right of redemption if a share is about to change owners. A special feature in this clause is that the redemption price is the nominal price of the share. In addition, the articles of association have included a consent clause and redemption obligation.

Without the special ownership structures and forms, the companies would have been attractive to many private utilities. They have large networks adjacent to each other and large distribution volumes. The areas the benchmark companies operate in are highlighted in Figure 7.

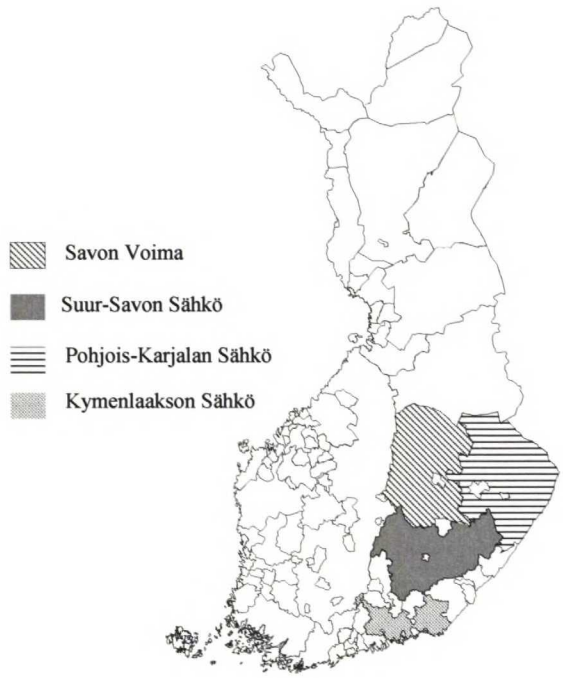


Figure 7. Distribution network areas of benchmark companies in 2007 (Finnish Energy Industries, 2006; EMA, 2008d)

7.4 Acquiring companies

Three companies were behind the case acquisitions: Lounais-Suomen Sähkö (later IVO, now Fortum), Graninge (now E.ON) and Vattenfall. IVO (now Fortum) had been the dominating state-owned electricity utility in Finland (for further information, see Section 2.1), whereas Swedish Graninge and Vattenfall entered the market with acquisitions. Distribution area of these utilities can be seen in the following figure.

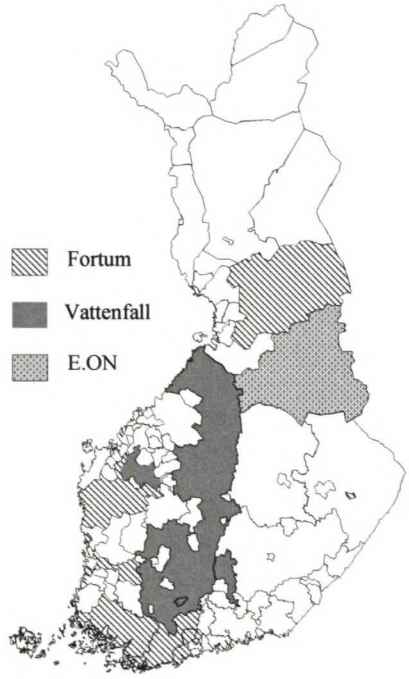


Figure 8. Distribution network areas of Fortum, Vattenfall and E.ON in 2007 (Finnish Energy Industries, 2006; EMA, 2008d)

IVO began the wave of mergers by obtaining foothold in the companies of western Finland. In 1996, it acquired 65% of the Finland's largest regional company of that time, Länsivoima Oy. The company owned several large distributors, for example Lounais-Suomen Sähkö Oy and Megavoima Oy. By the end of 1998, IVO had acquired majorities of Tuusulanjärven Energia and Koillis-Pohjan Sähkö Oy. In 1998, IVO merged with state-owned oil company Neste Oy and formed Fortum Oyj. In 2000-2001, the previously acquired companies were merged completely to Fortum and the distribution activites were gathered under one company, Fortum Sähkönsiirto Oy. Fortum was one of the first companies alleged to have excessive pricing in certain distribution areas.

Divestments took place in Fortum's oil business and finally in 2005 the oil-refining business was span off and listed in the stock exchange under name Neste Oil Oyj. With subsequent mergers in Sweden and the takeover of E.ON Finland Oyj, Fortum had become the largest distributor and retail power supplier in the Nordic Countries with annual turnover of €4.5 billion in 2007. Only Vattenfall had more power generation in the Nordic Countries.

Finnish subsidiary of Vattenfall, a Swedish fully state-owned utility, was established in 1994. Soon after entering the market, it acquired a minority stake in Jyllinkosken Sähkö Oy. However, the municipal owners rejected further share purchases and surprisingly sold the

majority to Lounais-Suomen Sähkö Oy. The first majority acquisition was achieved with Lapuan Sähkö, which was followed by takeover of Hämeen Sähkö Oy. In 1999, Vattenfall's negotiations with regional companies' owners came into fruition and it succeeded to purchase three companies: Revon Sähkö Oy, Heinolan Energia and Keski-Suomen Valo Oy. The last utility taken over by Vattenfall was Hämeenlinnan Energia in 2000. The distribution networks were finally gathered under a single company in 2002 which unified distribution pricing in the service areas of the companies. While concentrating on organic growth in Finland, Vattenfall has penetrated other Northern European markets with acquisitions. The company had a turnover of €13.2 billion in 2007.

At the time of the acquisition of Kainuun Sähkö, Graninge was an energy and forest industry company, which had operations in Sweden and Finland. It was listed in the Stockholm Exchange and its major shareholder was Electricité de France (EdF). Graninge entered Finland by acquiring minority share in Kainuun Sähkö Oy in 1997. In 1998 it acquired Ahlström Energia as an investment in power generation capacity. The last notable share acquisition took place in 2002 when Graninge gained majority share in Kainuun Sähkö. In 2003 Sydkraft AB, a subsidiary of German energy giant E.ON AG, acquired sole control of Graninge from EdF. By the time of the acquisition Graninge had turnover of €370 million.

8 Results

The purpose of this Thesis was to study effects of an electricity utility merger on the target company's pricing and on economy of the target's municipal owners. First, the Literature review developed the theoretical framework on Finnish electricity utility mergers. Second, the empirical part of the study tested propositions based on the conceptual framework and analyzed motivations for the case mergers. The Empirical study's main focus was on electricity pricing around the merger year and the implications of share sale for municipal economy. In addition, the case descriptions provided background for discussion on successful Finnish electricity utility mergers.

The methods and data used in the analysis were described in the previous section and hereafter the results of the work are presented. Firstly, the price changes in connection with eight takeovers are discussed in Section 8.1. Secondly, the implications of share sale for the municipalities' wealth are presented in Section 8.2. Section 8.3 expands the analysis by discussing output of the calculations if alternative parameters were used. Section 8.4 concludes this part with discussion on non-price related factors that could have motivated the takeovers. The results are compared to previous studies when applicable.

8.1 Price development of case companies

The sample companies' electricity distribution prices have increased more than the national average price and a significant rise in prices has occurred one and three years after the merger. The increases have not been relatively large since the underlying benchmark price has risen as well during the review period.

The post-takeover price development of the six individual cases was also studied in connection with the share sale implication analysis. Their indexed price trajectories have been on a higher level compared to benchmark companies, but the difference has diminished towards the end of 2007. The aforementioned findings are presented in more detail in the following sections.

8.1.1 Price changes around merger year

In the analysis of takeover-related price changes, development of the underlying benchmark is a crucial factor affecting the results. The base case benchmark, national average price, has

shown a modest upward trend. In the benchmark sample including all consumer types, annual price changes are not statistically significant.

Findings of Kinnunen (2005) on price and cost efficiency of the firms seem to apply also for the time period used in this study. Based on time period 1997-2002 and monthly price data, the author concluded that prices have remained stable on average. She found reasons for the price stability from regulation, where as Teijonsalo (2008) and Saajo (2008) argue that the actual reason may be the non-profit maximizing pricing behaviour of the utilities.

Although the regional benchmark companies have been in firm municipal co-ownership, their annual price increases have exceeded the national level. They show statistically significant and positive annual price changes which are not very large, though. As was expected, Keravan Energia has rarely revised its prices and when it has, the prices have rather fallen than risen. The company has evidently fulfilled its mission to subsidy local community from this perspective. Results of the statistical analysis on annual price changes are presented in Table 12.

Table 12. Annual benchmark price changes in 1998-2007

Benchmark - all consumers	Arithmetic mean	Standard deviation	Number of observations	T-statistics value
National average	0.07 %	2.29 %	90	0.28
Kymenlaakson Sähkö	2.61 %	10.08 %	90	2.45*
Suur-Savon Sähkö	1.61 %	3.35 %	90	4.56*
Pohjois-Karjalan Sähkö	0.96 %	2.26 %	90	4.02*
Keravan Energia	-0.19 %	3.40 %	90	-0.52

*Average value is statistically distinguishable from zero at 95% confidence level.
Samples include all consumer types' annualized prices in 1998-2007.

Indicator of altered pricing behaviour is sudden rise in prices following the merger. In the case sample, statistically significant price increases exist one year after the merger and larger three years after. Price increases in the second year are not statistically significant in any consumer category. Furthermore, the later years do not provide any meaningful results, although Vattenfall's price increase in 2007 can be extracted from the data as statistically distinguishable price change. One must note that in this analysis, benchmark price has not been used, in other words benchmark price changes are zero. Table 13 shows the price increases in the selected time periods.

Table 13. Price increase by consumer category in first and third year after takeover

1st year after takeover	Arithmetic mean	Standard deviation	Number of observations	T-statistics value
All	1,89 %	3,65 %	70	4,32*
Households	1,92 %	3,15 %	28	3,23*
Agriculture	1,03 %	2,71 %	14	1,43
Services	4,09 %	7,29 %	7	1,48
Industry	1,67 %	3,11 %	21	2,47*
3rd year after takeover (annual)	**Arithmetic mean**	**Standard deviation**	**Number of observations**	**T-statistics value**
All	4,65 %	11,44 %	80	3,63*
Households	6,51 %	13,03 %	32	2,82*
Agriculture	6,09 %	13,53 %	16	1,80
Services	0,92 %	6,14 %	8	0,42
Industry	2,44 %	8,56 %	24	1,40
3rd year after takeover	**Arithmetic mean**	**Standard deviation**	**Number of observations**	**T-statistics value**
All	5,63 %	11,31 %	70	4,16*
Households	5,62 %	11,48 %	32	2,77*
Agriculture	5,26 %	13,41 %	14	1,47
Services	5,21 %	10,77 %	7	1,28
Industry	4,95 %	9,54 %	21	2,38*

*Average value is statistically distinguishable from zero at 95% confidence level.
Sample includes ten companies' data. Sample sizes vary between consumer categories since they have been formed of ten EMA consumer types.

Inclusion of the base case benchmark in the analysis changes the results to some extent. The price increases in the sample are larger than those of the benchmark in the first year, but significant changes can be observed only after three years from the merger (see Table 14). Average price increase within the household category has been only 0.6% over the benchmark for one year interval. For three year interval, the difference to benchmark is only 2.36%, while statistical significant deviations from zero can only be found when all price categories are included in the sample. These results suggest that the first hypothesis should not be rejected. Analysis against other benchmarks would not provide any significant results since national benchmark already shows some upward trend in prices.

Table 14. Price increase over national benchmark in first and third year after takeover

1st year after takeover	Arithmetic mean	Standard deviation	Number of observations	T-statistics value
All	0,60 %	3,71 %	70	1,35
Households	0,40 %	3,00 %	32	0,75
Agriculture	-0,28 %	2,74 %	14	-0,38
Services	3,27 %	7,06 %	7	1,22
Industry	0,46 %	3,26 %	21	0,64
3rd year after takeover (annual)	**Arithmetic mean**	**Standard deviation**	**Number of observations**	**T-statistics value**
All	4,03 %	10,92 %	80	3,3*
Households	5,68 %	12,33 %	32	2,61*
Agriculture	5,55 %	13,06 %	16	1,70
Services	0,91 %	5,83 %	8	0,44
Industry	1,85 %	8,33 %	24	1,09
3rd year after takeover	**Arithmetic mean**	**Standard deviation**	**Number of observations**	**T-statistics value**
All	2,36 %	10,41 %	80	2,02*
Households	2,50 %	11,06 %	32	1,28
Agriculture	2,20 %	12,36 %	16	0,71
Services	3,63 %	10,21 %	8	1,01
Industry	1,78 %	8,68 %	24	1,01

*Average value is statistically distinguishable from zero at 95% confidence level.
Values are calculated as the difference between a case company's and the benchmark's annual price change.
Sample includes ten companies' data. Sample sizes vary between consumer categories since they have been formed of ten EMA consumer types.

Some evident explanations for the time lag in price increases arise. Pressure from the community may have prevented instant price increases. McLaughlin and Mehran (1995) describe cases where bidders have offered to lower or frozen rates after the merger. In some cases Vattenfall promised to freeze prices in the area of the owner municipalities. Fortum did the same in the city of Espoo when it acquired E.ON Finland's business. To avoid bad publicity, a more suitable time to adjust prices upwards may occur few years after the deal or at the same time with decrease of supply price, for instance.

Merging intra-group distribution companies may also have been a favourable moment to increase tariffs. Vattenfall had all of the acquired network assets gathered under single entity by 2003, which harmonized price level for all of the consumers receiving distribution services from the group. Subsequently, distributions prices for households rose approximately 25% in some of the municipalities at once. E.ON harmonized the prices of the cities of Espoo and Joensuu which surprisingly lowered the prices within both cities.

8.1.2 Price development of case companies and benchmarks

The previous sections imply that acquisition related price increases have existed, but they have been modest if assessed against the national benchmark. When analyzing implications of the share sale, the price development that would have been realized under the municipal co-ownership was estimated and is now compared to the actual situation. Figure 9 shows the indexed prices of the six case companies regarding electricity distribution price to households. This particular consumer segment has experienced the largest price fluctuations and is the most important for the distributor in terms of revenue in most of the cases.

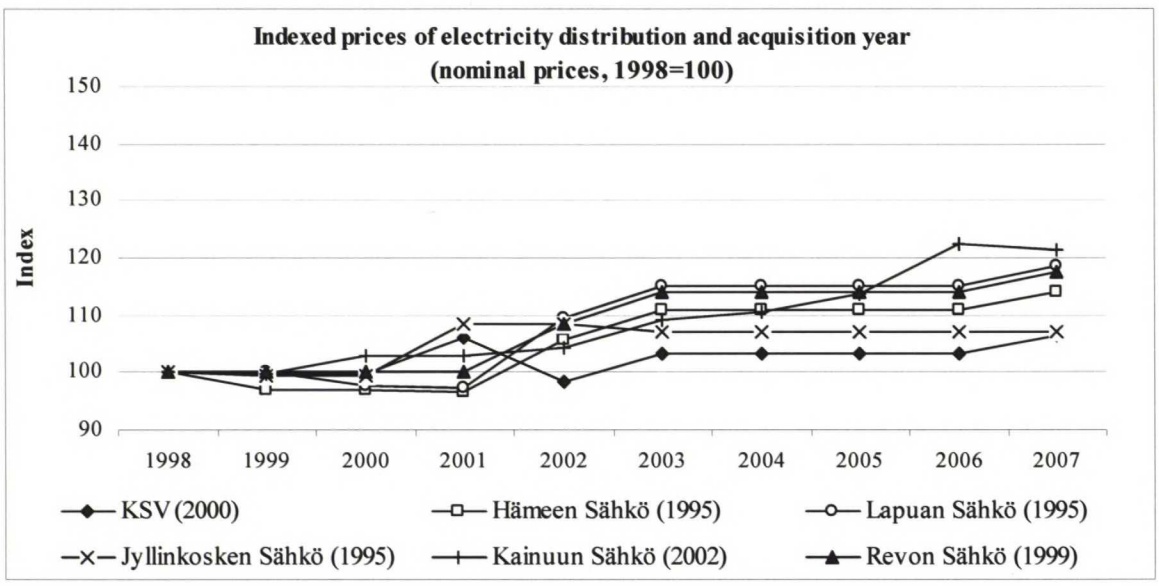


Figure 9. Indexed household electricity prices charged by case companies in 1998-2007

Household price is average price of EMA consumer categories K1, K2, L1 and L2.

The household prices have risen by 6-22% from 1998 in the areas of the case companies. Should the simulated prices for 1995-1998 for Hämeen Sähkö, Lapuan Sähkö and Jyllinkosken Sähkö be taken into account, the household prices have increased 29% at the maximum since takeover. However, the simulated post-acquisition price data may not represent fully the actual situation. Price curves imply that rise in the case companies' prices have been relatively modest. After all, the benchmark companies' price indices have approached the case companies' values or even exceeded those in the end of the review period (see Figure 10)

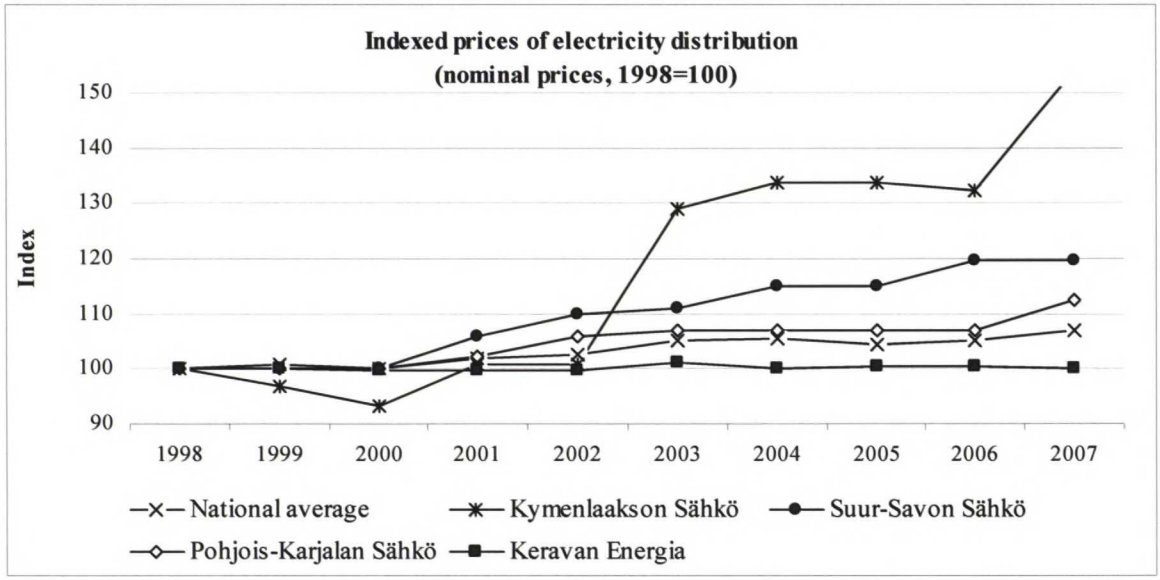


Figure 10. Indexed household electricity prices of benchmarks in 1998-2007

Household price is average price of EMA consumer categories K1, K2, L1 and L2.

The benchmark companies which have network activities in extensive rural areas show upward sloping price curves. Municipally co-owned Kymenlaakson Sähkö and Suur-Savon Sähkö have frequently revised their prices upwards and have index values of 154 and 120 in the end of the review period, respectively. The other benchmarks show 13% increase at the maximum, Keravan Energia having almost flat nominal prices since 1998. The graphs indicate that a company's ownership affects the consumers' distribution cost. However, magnitude of the effect depends on the chosen benchmark.

The observed price changes are in line with the information given by the windfall profit statistics and the findings of previous research. For instance, Fortum has adjusted its pricing downwards in order to avoid exceeding the limit of reasonable return. On the contrary, Vattenfall increased its prices after making windfall loss. The company has kept its prices at the same level between 2003 and 2006 to all customer types. Kymenlaakson Sähkö's enormous price increase already in 2003 may relate to implementation of a profit-seeking strategy which introduced dividend payouts. To conclude, ownership form seems to influence pricing, which has been noticed by several authors (De Alessi, 1974; Hollas & Stansell, 1998; Hollas et al. 1994; Hjalmarsson & Veiderpass, 1992a).

8.2 Net gains from share sale

Despite the rise in prices after the case mergers, the share sale has had a positive effect on the municipalities' economy in majority of the cases. In four out of six cases the net gain, the

difference between present values of proceeds and the contributions, has been positive. There are some explanations for the magnitudes of gains on a company level, but owner-specific analysis provides no significant results.

8.2.1 Company specific gains

The selling proceeds have adequately compensated the takeover related price increases. As far as all of the cases are concerned, the present value of delta cost has not exceeded the present value of selling proceeds, except in the case of Lapuan Sähkö (see Figure 11). Jyllinkosken Sähkö, Lapuan Sähkö and Hämeen Sähkö do not have detectable dividend history and therefore their former shareholders' gain is only measured as a difference of the proceeds and delta cost. One must note that the absolute amount of gain is not important as it is divided between the owner municipalities. The division is further discussed in Section 8.2.2.

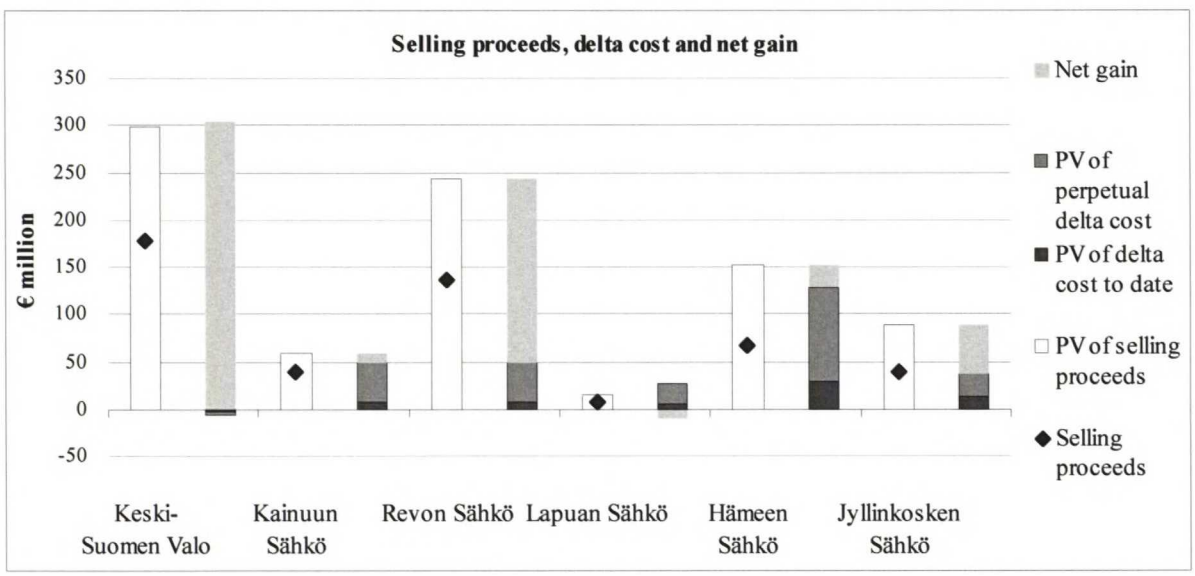


Figure 11. Financial implications of share sale - selling proceeds, delta cost and net gain

Figure shows the results of the analysis regarding financial implications of share sale. Opportunity cost of losing dividends is excluded in this analysis. Positive net gain indicates that the municipality has financially benefited from the share sale. All figures are present values as of 31 December 2007.

The value of delta cost relative to selling proceeds varies over a wide range. Surprisingly, the distribution customers of Keski-Suomen Valo have gained from the ownership change as Vattenfall has kept the prices stable in the area while benchmark price has risen. Revon Sähkö's delta cost is also small compared to the total selling proceeds. All in all, the realized and perpetual delta cost has reduced the value of the selling proceeds to a larger extent, 67% on average.

Based on distribution of the delta cost, one can draw conclusions also about the case companies' pricing. In the cases where Vattenfall was involved, the delta cost to date has been relatively small, but as of 2007 the price difference to the benchmark has grown. As far as Kainuun Sähkö is concerned, most of the present value of the delta cost is in the perpetual item. On average, the present value of realized delta cost has been 15% of the present value of the selling proceeds. The present value of perpetual delta cost has been 52%, respectively. These results support the findings of the previous sections on moderate, but meaningful, post-takeover price increases.

The evidence suggests that the acquiring firms have steadily increased their prices to a level, which is clearly above the simulated benchmark level in the end of the review period. However, the simulated prices for the first years may give a false price pattern for the early acquisitions. Regardless of simulated prices, results suggest that the excess distribution costs have not deteriorated the municipalities' economy alone, since the present value of the received cash from the shares is much larger. Thus, hypothesis *IIa* shall not be rejected. When dividends are taken into account, the situation becomes distinct.

When dividends contributions are included in the analysis, the gain from share sale diminishes to some extent. Results show that the selling proceeds were more than enough to offset the opportunity cost resulting from lost contributions comprising of dividends and delta cost in two cases (see Figure 12). The present value of gain from selling the shares has been €123 million for Keski-Suomen Valo municipal shareholders and €54 million for Revon Sähkö municipal shareholders. The figures represent 46% and 29% of the present value of selling proceeds. According to the analysis, Kainuun Sähkö's shareholders, however, would have been better off by holding the shares. The loss is €68 million for the previous municipal shareholders in the Kainuu province. Based on this evidence, hypothesis *IIb* shall not be rejected

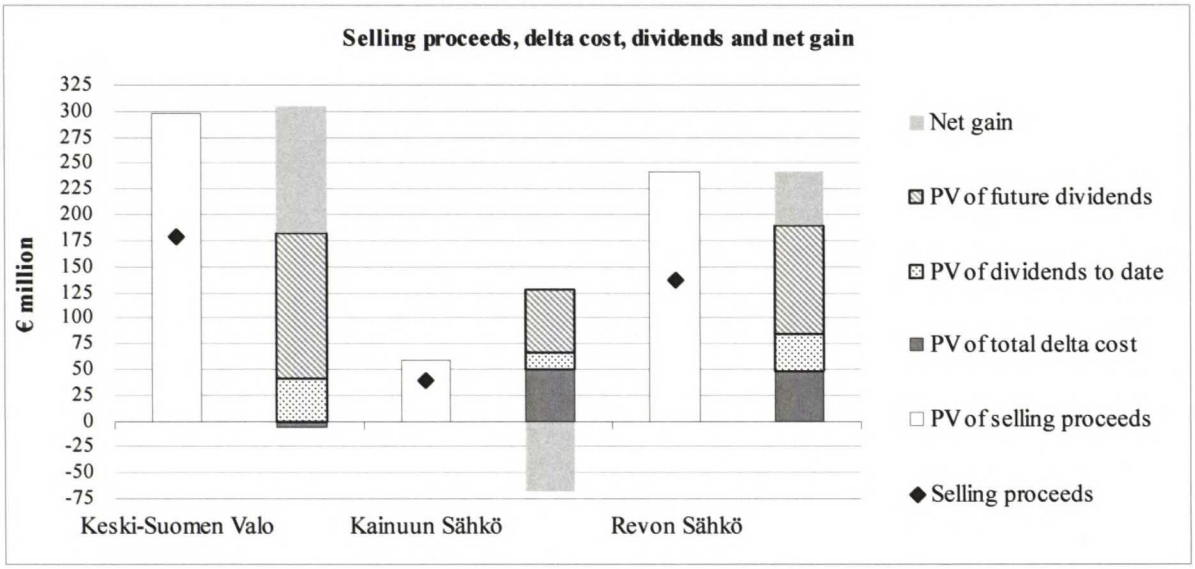


Figure 12. Financial implications of share sale - selling proceeds, delta cost, dividends and net gain

Figure shows the results of the analysis regarding financial implications of share sale. Positive net gain indicates that the municipality has financially benefited from the share sale. All figures are present values as of 31 December 2007.

There are few possible explanations for the magnitudes of the gains. The relatively large gain of Keski-Suomen Valo owners may be explained by the volume of the electricity utility business. Keski-Suomen Valo had distribution network in the area of 33 municipalities, whereas the company had only 22 municipality owners. Thus the owners held larger business than was actually in their interest, from the pricing policy perspective. The municipalities that sold shares of Kainuun Sähkö in the early phase may have not seen the potential of the company when determining the price for their shares. The company's performance has improved greatly since the first share transactions. Company specific gains are shown more in detail in Appendix A.

8.2.2 Municipality specific gains

Have some of the municipalities gained relatively more than the other in the transactions? The analysis shows mixed results on differences between municipality specific gains. Not surprisingly, the amount of selling proceeds has been closely related to a municipality's size in terms of electricity consumption (see Figure 13). In the case of other studied utilities than Revon Sähkö, the effect is not that significant, but still observable. After all, when no substantial generation assets exist, the ownership of the company should be proportional to the amount of electricity consumption (consumers) of an owner assuming that the regional company is formed of small single municipality owned companies (for more information, see

Section 2.1.3). Other significant relationships between gains and certain characteristics of the municipalities cannot be detected.

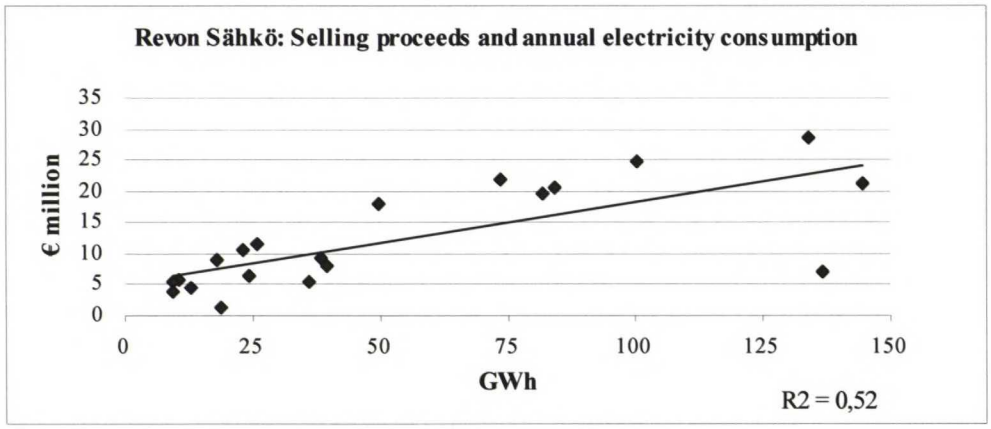


Figure 13. Regression analysis - Relationship between selling proceeds and electricity consumption of former owner municipalities of Revon Sähkö

Figure shows selling proceeds regressed against the municipalities' electricity consumption in 2007. R^2 coefficient is based on this single-variable model with 20 data points.

Magnitude of the gain is not dependent on electricity consumption structure of a municipality. According to the indexed prices and results of Hollas et al. (1994), municipalities whose total consumption is dominated by services and small- and medium scale industry should have gained more than densely populated municipalities. Although the household electricity prices have increased the most and households account for approximately half of the total consumption, no evidence on densely populated municipalities' worse position exists. The highly populated municipalities have owned such a large stake in their regional company that they have been financially well protected against the rising household electricity prices.

8.3 Sensitivity analysis

A sensitivity analysis of the results of the previous section was conducted in order to examine the effects of varying the base case assumptions. Results presented in the previous section are very much dependent on approach to sustainable pricing of a regional utility and riskiness of the cash flows. The base case assumption states that the municipally co-owned companies would not be able to keep the prices completely unchanged, but would make at least index increases with the same pace as the national benchmark. Another crucial assumption was made when discounting incremental cash flows to shareholders, the dividends and delta cost, with cost of capital used by the EMA. These parameters are to be challenged with alternative approaches that were introduced in Section 6.3.

Sensitivity analysis with one parameter changing at a time shows that selecting a low price benchmark does not decrease the amount of gain substantially, but applying low discount rate eliminates the benefits from the share sale. Using benchmark that follows pricing of Keravan Energia does not turn the gain negative in the cases where the base value has been positive. On the contrary, if the pricing of the case utilities had followed Suur-Savon Sähkö's price trend, the gains would be at the maximum five times the base case amount. This evidence confirms that the post-takeover price increases have not been unprecedentedly high compared to other regional utilities. Nonetheless, if the base case delta cost and selling proceeds are valued by using 5-year government bond as discount rate, the gains from selling the company break-even or turn negative.

The other sensitivity analysis factors show mixed results. Should the electricity price increase to 5% higher level after acquisition, representing the supply margin, the gain is diminished in all cases except Keski-Suomen Valo and Jyllinkosken Sähkö. This can be explained by the step change in the delta cost for the upcoming years. Robustness check for distribution of household consumption was conducted by increasing (decreasing) the consumer category's price by 25%. The results show that forming a single household consumer category does not cause significant error in the calculation. On the contrary, deviations in estimated dividend growth to eternity clearly affect the results. Figure 14 illustrates the results of the sensitivity analysis regarding Revon Sähkö (dividend paying company) and Lapuan Sähkö (non-dividend paying company). Figures regarding the other case companies are presented in Appendix C.

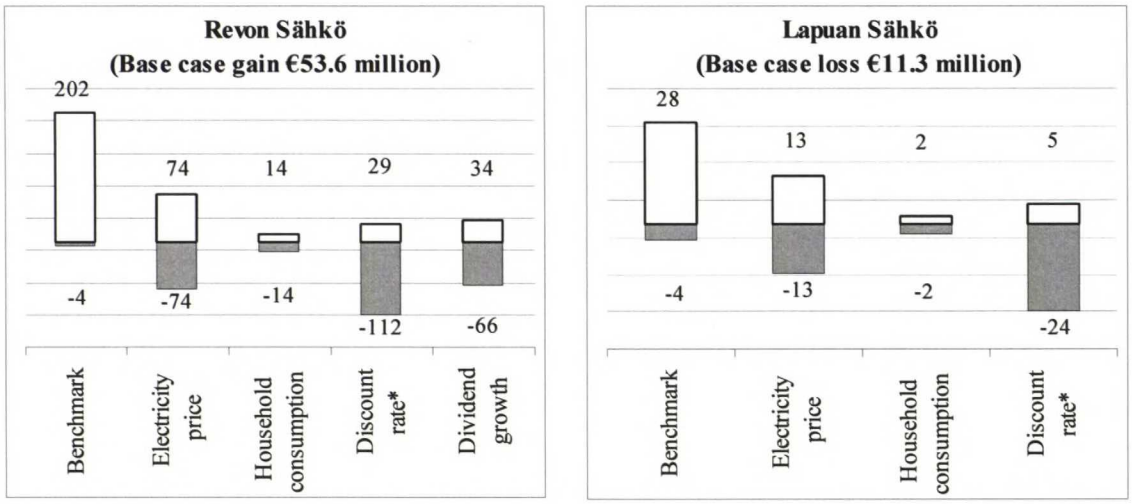


Figure 14. Sensitivity of net gain to certain parameters – cases Revon Sähkö and Lapuan Sähkö

Bars represent deviations from the base case net gain when the sensitivity analysis scenarios are applied. Figures are in millions.
*Used only in discounting delta cost and selling proceeds as the underlying assumption is that the municipally co-owned utilities are non-dividend paying companies.

The sensitivity analysis showed that varying the base case parameters alters the result substantially in some cases. The delta cost has a significant leverage if discounted with low discount rate or if the step change is made for the future cost. However, the selection of benchmark has asymmetric effects since the acquired utilities' pricing has followed and will presumably follow benchmark price development.

8.4 Other incentives to Finnish electricity utility mergers

Previous sections' empirical evidence suggests that prices have increased after the acquisition but not in magnitude that would give the acquiring firms considerable profits. There may have been alternative or additional incentives to the mergers than mere possibility for price increases. This section starts with discussion on post-acquisition cost-cutting in distribution operations and increase of electricity supply margin. Finally, some factors that have lead to acquisitions of especially these companies are addressed.

8.4.1 Cost cutting

Even though some authors (Meyer, 1975; Neuberg, 1977; Hjalmarsson & Veiderpass, 1992b) argue that municipally owned distributors are as efficient as privately owned, descriptive analysis shows that acquiring private companies have been able to cut controllable costs. Controllable costs are covered by the regulation and are used as basis for revenue cap in the following regulatory review periods. Cost-cutting in personnel may have been appropriate

since the municipal utility functions may have been overstaffed (Hollas & Stansell, 1988). Furthermore the sector as a whole had potential to reduce costs by 15% in the end of the 1990s (EMA, 2000). Post acquisition cost performance of Vattenfall, Graninge (Kainuun Sähkö) and E.ON can be extracted, because they lacked previous operations in Finland.

The foreign companies have succeeded to cut costs more than the regional benchmark companies. Under Graninge's ownership, Kainuun Sähkö has decreased its controllable costs by 35% in four years and the companies owned by E.ON by 38.1% in five years. Between 1999 and 2006, the benchmarks have been able to lower their costs only by 15-21%. Furthermore, Kymenlaakson Sähkö's costs have increased in the same period, partly due to restructuring of its regional distribution activities.

Some of the cost cutting potential regarding city municipalities of Vattenfall and E.ON is related to change in cost accounting principles (Teijonsalo, 2008). After changing ownership, some of the network maintenance costs were accounted as investments, which has allowed the companies to collect more revenue. Changes in controllable costs of acquiring and benchmark companies can be seen in Table 15.

Table 15. Decrease in controllable costs after mergers and comparable benchmarks' cost development

Electricity Distributor	Year of majority acquisition	Cost change in the period		
		Pre-acquisition (1999-)	Post-acquisition (-2006)	1999-2006
Vattenfall	1995-2000[1]	-	-	-22.2 %
Kainuun Sähkö (Graninge)	2002	-12.0 %	-35.0 %	-42.9 %
E.ON	2001	-5.6 %	-38.1 %	-41.6 %

Benchmarks[2]	Cost change in the period 1999-2006
Suur-Savon Sähkö	-16.1 %
Pohjois-Karjalan Sähkö	-21.2 %
Kymenlaakson Sähkö	12.5 %
Total sector	-15.0 %

[1]Several acquisitions starting from 1995, cost change calculated only from 1999

[2]Savon Voima excluded due to uncomparable data. The company has restructured its distribution business and changed its accounting principles.
Controllable costs: Distribution losses, other material purchases, transmission grid fees, other services and personnel costs
Annual costs are obtained from financial statements of the distribution companies (EMA, 2008c)

Whatever the real reasons behind the cost cuttings have been, the acquirers have managed to reap the prevailing regulation by showing year by year lower controllable costs. While the revenue cap is set according to historical costs, decreasing costs ensures profit above the allowed maximum only in the short-term.

8.4.2 Increase of profitability in electricity retail sales

The acquiring firms have had higher retail electricity prices than the benchmarks, but the benefits from increasing the retail margin have probably been insignificant. First, as the retail electricity market is de-regulated, the customers have had a chance to change supplier in case they perceive the price unreasonable. Second, retail sales have been almost zero profit business for the large private utilities since the opening of the electricity market. Given these conditions, the acquiring companies may have only been able to minimize losses of the business without having possibilities to achieve substantial upsides. Figure 15 and Figure 16 show the development of retail electricity prices of the case companies and benchmarks, respectively.

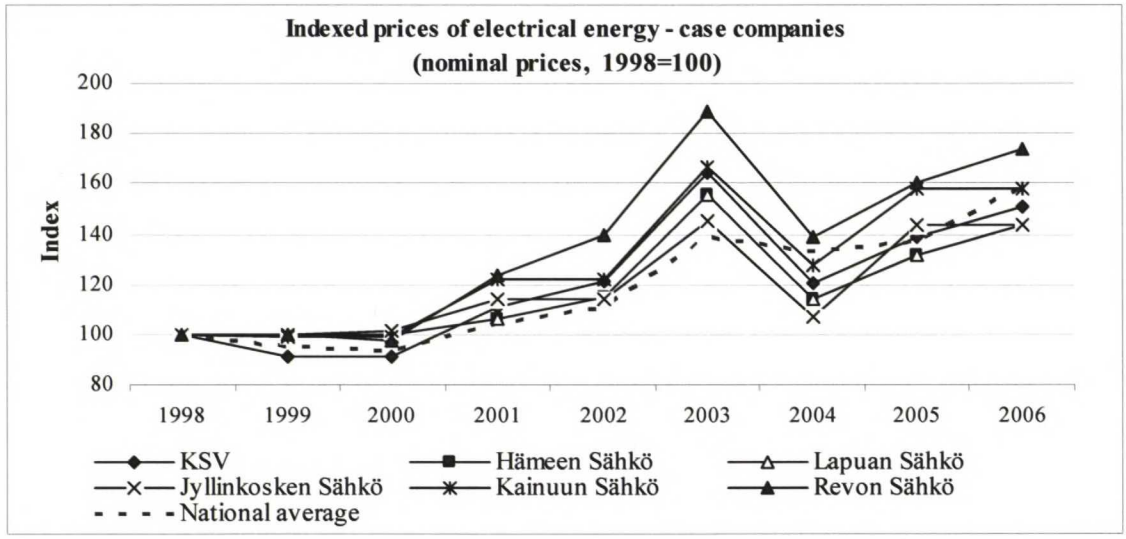


Figure 15. Indexed electrical energy prices charged by case companies (EMA, 2008c)

Price is average price of EMA household consumer categories K1, K2, L1 and L2.

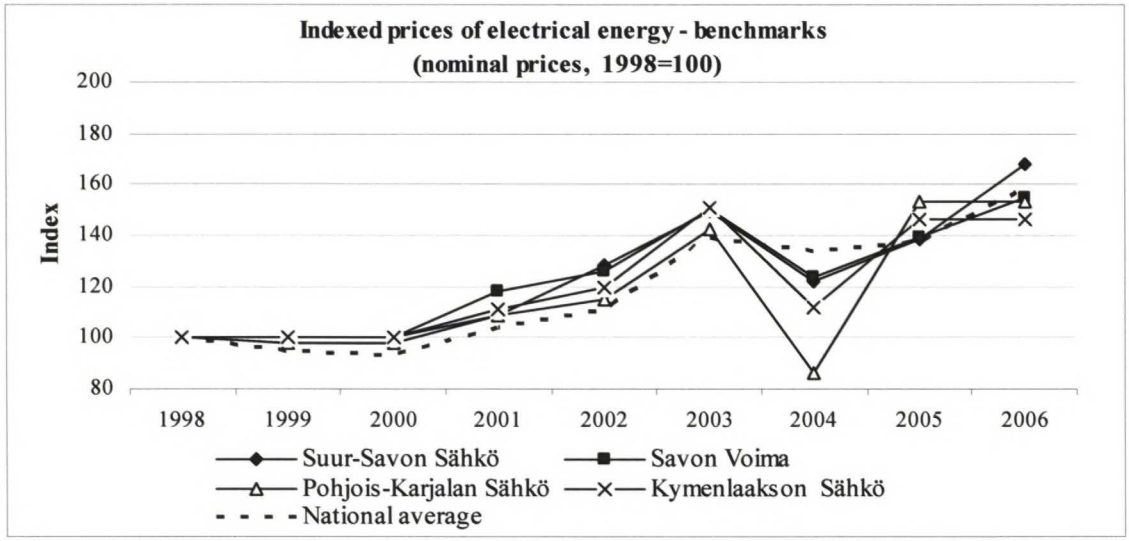


Figure 16. Indexed electrical energy prices charged by benchmark companies (EMA, 2008c)

Price is average price of EMA household consumer categories K1, K2, L1 and L2.

Regardless of the higher prices, the realized benefits from improved relative sales margin cannot be measured comprehensively. The volumes and distribution of sales to different customer categories are unknown and therefore the possible gain from increasing prices for customers of the acquired company cannot be observed. To conclude, a possibility to improve profitability of retail sales has probably not justified the acquisitions from the bidder's perspective.

8.4.3 Favourable ownership base

Probably one of the most important factors affecting the success of the studied takeovers was a favourable ownership base and its organization. Simply put, the acquired utilities were among the few large and attractive utilities, whose owners were willing and able to sell their shares. In comparison to the other regional utilities, these companies did not take any actions to cement the ownership.

The defence mechanisms of Suur-Savon Sähkö, Pohjois-Karjalan Sähkö, Kymenlaakson Sähkö and Savon Voima are examples of barriers that could not have been overcome. Some of the takeover defences were, however, implemented after Vattenfall's entry to Finland. Fearing foreign corporate raider, the prevailing management and board set up walls around their company in the form of holding companies and particular clauses in the articles of association. Unanimous negative attitude towards mergers were needed in order to make these amendments in the organization of ownership.

Dispersed ownership that the acquired regional utilities had may have affected the decision to sell the shares. Municipalities with small energy consumption may have had too few incentives to drive non-profit orientated pricing policy, which is more favourable for more densely populated municipalities. A low price policy has restricted the dividend payouts that could have been valuable for some of the owners. Keski-Suomen Valo at least would have been able to reward its owners more generously. Following the acquisition, Vattenfall paid to its parent company almost 80% more dividends than was paid previous year before the acquisition.

Some of the municipalities were not keen on owning utility shares while having financing deficits. Newspapers argued that financially weak municipalities were eager to sell their stake to balance their deficit. When selling the shares for a reasonable price a municipality is able to decide on the risk and expected return on its invested capital. For example, less powerful municipality owners of Kainuun Sähkö initiated the discussion on selling the shares in order to diversify their investments to other industries.

Part IV – Conclusions

9 Conclusions

This Thesis analyzed takeovers of electricity utilities where the ownership changed from municipalities to a private entity. Firstly, this Thesis sought to compare electricity pricing under two alternative modes of organization – municipal versus private ownership. Secondly, this Thesis analyzed implications for municipal economy in connection with the sale of local utility business to a private company. The conceptual framework highlighted the incentives to a merger from the main stakeholders' perspective and the empirical model analyzed pricing and municipal economy on the basis of ten merger cases.

The first main implication was that ownership change from municipal to private has increased electricity distribution prices, but the increases have been relatively small in comparison to price development of municipally owned benchmark companies. The empirical results provide support for the findings of previous studies (e.g. Averch & Johnson, 1962; De Alessi, 1974; Hollas et al., 1994) on weak, but meaningful ownership effect. However, more significant difference in pricing was expected based on windfall profit and loss statistics (EMA, 2008) and on findings on municipal low-price policy (Hollas & Stansell, 1988; Hjalmarsson & Veiderpass; 1992a).

The second main finding is that municipalities which have outsourced their electricity utility have received a sufficient price for the business considering the utility's former contributions to the owner - low prices and/or dividends. In four out of six cases the present value of selling proceeds has exceeded the opportunity cost from losing the contributions. The empirical evidence contradicts arguments that selling the local utility necessarily deteriorates the municipal economy. Within the prevailing regulation scheme, charging excess rates will be penalized and significant price increases cannot be executed frequently.

The results suggest that there were other incentives to the case mergers than only a possibility to increase monopoly prices. Potential for cost-cutting and increase of electrical energy sales margin may have been among the main motives for the mergers. The findings on superior cost efficiency of private utilities agree with the results of Hollas and Stansell (1988) and Burns and Weyman-Jones (1996). Most importantly, wide-ranging application of takeover defences

in the sector has directed the bidders to approach only certain companies and limited the takeover activity.

The study broadened knowledge on electricity utilities' pricing behaviour and on European electricity company mergers. Based on the findings of this study, municipalities contemplating selling their electricity utility may assess the pros and cons of the share sale in a new light. The level of accuracy achieved in the study was adequate for finding differences between price development of the case companies and the benchmarks around the merger year. As far as the share sale analysis is concerned, the model captured the main financial impacts and the method robustness was tested with sensitivity analysis. The results apply also when the target is owned only by one municipality. However, the empirical model was unable to measure other than financial implications resulting from the share sale and concerning the selling municipality.

The results of this Thesis provide promising avenues for future research. Firstly, the conceptual framework and the methodology could be applied in other countries or sectors with similar regulation and market structure. Secondly, research on relationship between political situation and outsourcing activity in utility business could deepen knowledge on factors affecting a merger's success. Thirdly, study on the actual use of the selling proceeds from utility shares or other shares could give another perspective on municipal opportunity cost.

References

Literature

Acton, J & Vogelsang, I 1989. Introduction. *Rand Journal of Economics*, Volume 20, pages 369-372.

Adato Energia Oy 2003. *Electricity and district heating in 2002*. Adato Energia Oy, Rauma.

Atkinson, S & Halvorsen, R 1986. The relative efficiency of public and private firms in regulated environment: the case of U.S. electric utilities. *Journal of Public Economics*, Volume 29, pages 281-294.

Averch, H & Johnson, L 1962. Behavior of the firm under regulatory constraint. *American Economic Review*, Volume 52, pages 1052-1069.

Bank of Finland 2008. *Talouden näkymät 1 – 2008*. Suomen Pankin julkaisu- ja kielipalvelut. Helsinki

Baumol, W 1995. Modified regulation of telecommunications and the public interest standard. In: Bishop, M & Kay, J & Mayer, C (Editors). *The Regulatory Challenge*. Oxford University Press, Oxford. Pages 254-282.

Berg, S & Tschirhart, J 1988. Natural monopoly regulation: principles and practise. Cambridge University Press, Cambridge.

Borge, L-E 2000. Charging for public services: the case of utilities in Norwegian local governments. *Regional Science and Urban Economics*, Volume 30, pages 703-718.

Brealey, R & Cooper, I & Habib, M 1997. Investment appraisal in the public sector. *Oxford Review of Economic Policy*, Volume 13, Number 4, pages 12-28.

Brealey, R & Myers, S 2003. *Principles of Corporate Finance*. Seventh Edition. McGraw-Hill, New York.

Burns, P & Weyman-Jones, T 1996. Cost functions and cost efficiency in electricity distribution: a stochastic frontier approach. *Bulletin of Economic Research*, Volume 48, Issue 1, pages 41-64.

Codognet, M-K & Glachant, J-M & Hiroux, C & Mollard, M & Leveque, F & Plagnet, M-A 2003. *Mergers and Acquisitions in the European Electricity Sector: Cases and Patterns*. International symposium on the M&A's in the EU electricity sector. Third Edition. Ecole des Mines de Paris.

Cox, A & Portes, J 1998. Mergers in regulated industries: the uses and abuses of event studies. *Journal of Regulatory Economics*, Volume 14, pages 281-304.

Dehoog, R & Swanson B 1988. Tax and Spending Effects of Municipal Enterprises: The Case of Florida Electric Utilities. *Public Budgeting and Finance*, Volume 8, Number 1, pages 48-57.

Deno, K & Mehay, S 1988. Municipal utilities and local public finance: A simultaneous model. *Public Choice*, Volume 57, pages 201-212.

De Alessi, L 1974. An Economic Analysis of Government Ownership and Regulation: Theory and Evidence from Electric Power Industry. *Public Choice*, Volume 19, Issue 1, pages 1-42.

DiLorenzo, T 1982. Utility profits, fiscal illusion, and local public expenditures. *Public Choice*, Volume 38, Number 3, pages 243-252.

Domah, P & Pollitt, M 2001. The Restructuring and Privatisation of Electricity Distribution and Supply Businesses in England and Wales: A Social Cost-Benefit Analysis. *Fiscal Studies*, Volume 22, Number 1, pages 107-146.

EMA 2007a. Energy Market Authority. *Sähkön alueverkkotoiminnan hinnoittelun kohtuullisuuden arvioinnin suuntaviivat vuosille 2008-2011*. Energy Market Authority, Helsinki.

EMA 2004. Energy Market Authority. Guidelines for assessing reasonableness in pricing of national transmission network operations for 2005-2007: unofficial translation. Energy Market Authority, Helsinki.

Filippini, M 1998. Are municipal distribution utilities natural monopolies? *Annals of Public and Cooperative Economics*, Volume 69, Number 2, pages 157-174.

Flemming, J & Mayer, C 1997. The assessment: public-sector investment. *Oxford Review of Economic Policy*, Volume 13, Number 4, pages 1-11.

Färe, R & Grosskopf, S & Logan, J 1985. The relative performance of publicly-owned and privately-owned electric utilities. *Journal of Public Economics*, Volume 26, pages 89-106.

Grout, P 2003. Public and private sector discount rates in public-private partnerships. *The Economic Journal*, Volume 113, pages C62-C63.

Hendrickson, J 2003. Mergers and Acquisitions as a Vehicle to Create Value in Uncertain Times. *Electricity Journal*, Volume 16, Issue 6, pages 66-75.

Hjalmarsson, L & Veiderpass, A 1992a. Efficiency and ownership in Swedish electricity retail distribution. *Journal of Productivity Analysis*, Volume 3, pages 7-23.

Hjalmarsson, L & Veiderpass, A 1992b. Productivity in Swedish Electricity Retail Distribution. *Scandinavian Journal of Economics*, Volume 4, pages S193-S205.

Hollas, D & Stansell, S 1988. An Examination of the Effect of Ownership Form on Price Efficiency: Proprietary, Cooperative and Municipal Electric Utilities. *Southern Economic Journal*, Volume 55, Number 2, pages 336-350.

Hollas, D & Stansell, S & Clagget, T 1994. Ownership Form and Rate Structure: An Examination of Cooperative and Municipal Electric Distribution Utilities. *Southern Economic Journal*, Volume 61, Number 2, pages 519-529.

Huettner, D & Landon, 1978. Electric utilities: scale economies and diseconomies. *Southern Economic Journal*, Volume 44, pages 883-912.

Jamasb, T & Pollitt, M 2003. International benchmarking and regulation: an application to European electricity distribution utilities. *Energy Policy*, Volume 31, pages 1609-1622.

Jensen, M & Ruback, R 1983. The market for corporate control. *Journal of Financial Economics*, Volume 11, pages 5-50.

Kinnunen, K 2005. Pricing of electricity distribution: an empirical efficiency study in Finland, Norway and Sweden. *Utilities Policy*, Volume 13, pages 15-25.

Korhonen, P & Syrjänen, M 2003. Evaluation of Cost Efficiency in Finnish Electricity Distribution. *Annals of Operations Research*, Volume 121, pages 105-122.

Kwoka, J 2005. Electric power distribution: economies of scale, mergers and restructuring. *Applied Economics*, Volume 37, pages 2373-2386.

Laffont, J-J & Tirole J 1993. A Theory of Incentives in Procurement and Regulation. MIT Press, Cambridge, MA.

Leggio, K & Lien, D 2000. Mergers in the Electric Utility Industry in a Deregulatory Environment. *Journal of Regulatory Economics*, Volume 17, pages 69-85.

Lind, R 1990. Reassessing the government's discount rate policy in light of new theory and data in a world economy with a high degree of capital mobility. *Journal of Environmental Economics and Management*, Volume 18, Issue 2, pages S1-S85.

McLaughlin, R & Mehran, H 1995. Regulation and the Market for Corporate Control: Hostile Tender Offers for Electric and Gas Utilities. *Journal of Regulatory Economics*, Volume 8, pages 181-204.

Meyer, R 1975. Publicly owned versus privately owned utilities: a policy choice. *The Review of Economics and Statistics*, Volume 57, Number 4, pages 391-399.

Midttun, A & Summerton, J 1998. Loyalty or competition? A comparative analysis of Norwegian and Swedish electricity distributors' adaptation to market reform. *Energy Policy*, Volume 26, pages 143-158.

Moore, T 1970. The Effectiviness of Regulation of Electric Utility Prices. *Southern Economic Journal*, Volume 36, Issue 4, pages 353-364.

Myllyntaus, O 2002. *Kunnan ja kuntayhtymän sijoitustoiminnan perusteista päättäminen.* First edition. Suomen Kuntaliitto, Helsinki.

Nelson, R & Primeaux W 1988. The Effects of Competition on Transmission and Distribution Costs in the Municipal Electric Industry. *Land Economics*, Volume 64, Issue 4, pages 338-336.

Neuberg, L 1977. Two Issues in the Municipal Ownership of Electric Power Distribution Systems. *The Bell Journal of Economics*, Volume 8, pages 303-323.

Newbery, D & Pollitt, M 1997. The Restructuring and Privatisation of Britain's CEGB -Was It Worth It? *The Journal of Industrial Economics*, Volume 45, Number 3, pages 269-303.

OECD, 1997. Organisation for Economic Co-operation and Development. *Application of Competition Policy to the Electricity Sector*. Series of Roundtables on Competition Policy, Number 12. OECD/OCDE, Paris.

Pineau, P-O & Hämäläinen, R 2000. A perspective on the restructuring of the Finnish electricity market. *Energy Policy*, Volume 28, pages 181-192.

Ray, D & Thompson H 1990. "Fifty in Five"; The Prospects for Merger in the Electric Utility Industry. *Journal of Regulatory Economics*, Volume 2, pages 111-128.

Roberts, M 1986. Economies of Density and Size in the Production and Delivery of Electric Power. *Land Economics*, Volume 62, Issue 4, pages 378-387.

Robison, H & Davidson, W & Glascock J 1995. The Formation of Public Utility Holding Companies and Their Subsequent Diversification Activity. *Journal of Regulatory Economics*, Volume 7, pages 199-214.

Rose, N & Joskow, P 1990. The diffusion of new technologies: evidence from the electric utility industry. *RAND Journal of Economics*, Volume 21, Number 3, pages 354-373.

Rubin, I 1988. Municipal Enterprises: Exploring Budgetary and Political Implications. *Public Administration Review*, Volume 48, Issue 1.

Saajo, V-P 2008. Ensimmäisen valvontajakson laskelmat ja valvontapäätösten valmistelu. Proceedings of the seminar *Energiamarkkinaviraston Sähkömarkkinoiden Keskustelupäivä* 11 March 2008. Helsinki.

Salvanes, K & Tjotta, S 1998. A Test for Natural Monopoly with Application to Norwegian Electricity Distribution. *Review of Industrial Organization*, Volume 13, pages 669-685.

Sandmo, A 1972. Discount rates for public investment under uncertainty. *International Economic Review*, Volume 13, Number 2, pages 287-302.

Sandmo, A & Dreze, J 1971. Discount Rates for Public Investment in Closed and Open Economies. *Economica*, Volume 38, Issue 152, pages 395-412.

Savas, E 2000. *Privatization and public-private partnerships*. Chatham, NJ: Chatman House.

Schleifer, A 1985. A theory of yardstick competition. *Rand journal of Economics*, Volume 16, pages 319-327.

SENER, 2000. Finnish Electricity Association. *Short History of Free Electricity – Deregulation and Pain Spots of The Finnish Electricity Market*. SENER.

Shleifer, A & Vishny, R 1988. Value Maximization and the Acquisition Process. *The Journal of Economic Perspectives*, Volume 2, Number 1, pages 7-20.

Spackman, M 2004. Time Discounting and of the Cost of Capital in Government. *Fiscal Studies*, Volume 25, Number 4, pages 467-518.

Strauss, R & Wertz, K 1976. The impact of municipal electric profits on local public finance. *National Tax Journal*, Volume 29, Issue 1, pages 22-30.

Sähkömarkkinakeskus 2000. *Sähkömarkkinakeskuksen vuosikertomus 1999*. Lappeenrannan kirjapaino Oy, Lappeenranta.

Sähkömarkkinalaki 2007. Sähkömarkkinalaki 386/1995, including amendments 1018/1995, 332/1998, 138/1999, 466/1999, 623/1999, 444/2003, 1130/2003, 1172/2004, 624/2007, 1326/2007.

Tichy, G 2001. What Do We Know about Success and Failure of Mergers? *Journal of Industry, Trade and Competition*, Volume 1, pages 347-394.

Tyer, C 1989. Municipal Enterprises and Taxing and Spending Policies: Public Avoidance and Fiscal Illusions. *Public Administration Review*, Volume 49, Number 3, pages 249-256.

Viljanen, S & Tahvanainen, K & Lassila, J & Honkapuro, S & Partanen, J 2004. Regulation of electricity distribution business. Proceedings of the *Nordic Distribution and Asset Management Conference* 23-24 August 2004. Espoo.

VTT 2004. VTT Technical Research Center of Finland. *Energia Suomessa: Tekniikka, talous ja ympäristövaikutukset*. Third edition. Edita Prima Oy, Helsinki.

Weyman-Jones, T 1995. Problems of yardstick regulation in electricity distribution. In: Bishop, M., Kay, J., Mayer, C. (Editors). *The Regulatory Challenge*. Oxford University Press, Oxford. Pages 423-443.

Willner, J 2003. *Privatisation and public ownership in Finland*. Center for Economic Studies, Munich.

Yatchew, A 2000. Scale economies in electricity distribution: a semiparametric analysis. *Journal of Applied Econometrics*, Volume 15, pages 187-210.

Internet Sources

Helsingin Energia 2008. Tilinpäätös ja avainluvut. http://www.helsinginenergia.fi/vuosi2007/ tp_tunnusluvut.html. 30 March 2008.

EMA 2008a. Energy Market Authority. Vuosien 2005-2006 aikana kertyneet sähköverkkotoiminnan tuoton yli- ja alijäämät. http://www.energiamarkkinavirasto.fi/ data.asp?articleid=1524&pgid=237&languageid=246. 25 April 2008.

EMA 2008b. Energy Market Authority. Energy Market Authority. http:// www.energiamarkkinavirasto.fi/ select.asp?gid=102&languageid=. 15 January 2008.

EMA 2008c. Energy Market Authority. Sähkön hintatilastot. http://www.energiamarkkinavirasto.fi/select.asp?gid=67&pgid=67. 1 March 2008.

EMA 2008d. Energy Market Authority. Sähkö- ja maakaasuyritysten eriytetyt tilinpäätöstiedot vuodelta 2006. http://www.energiamarkkinavirasto.fi/data.asp?articleid=1465&pgid=69. 1 February 2008.

EMA 2007b. Energy Market Authority. Sähköverkkotoimintaan sitoutuneen pääoman kohtuullinen kustannus vuodelle 2008. http://www.energiamarkkinavirasto.fi/data.asp?articleid=1475&pgid=195. 2 February 2008.

EMA 2003. Energy Market Authority. Lehdistötiedotteet 2003. http://www.energiamarkkinavirasto.fi/select.asp?gid=144&pgid=144. 22 March 2008.

EMA 2000. Energy Market Authority. Suomen sähköverkkoyhtiöiden tehokkuutta tutkittiin. http://www.energiamarkkinavirasto.fi/data.asp?articleid=37&pgid=64. 22 March 2008

EMA 1998. Energy Market Authority. Lehdistötiedotteet 1998. http://www.energiamarkkinavirasto.fi/select.asp?gid=144&pgid=144. 22 March 2008.

Finnish Energy Industries 2006. Sähköverkkoyhtiöt. http://www.energia.fi/fi/sahko/sahkoverkko/sahkoverkkoyhtiot. 24 February 2008.

Fortum 2007. Suurimmat Osakkeenomistajat. http:// www.fortum.fi/ general_framelink_body.asp?path=14020;14028;14029;14055;14215;14218;19541;24849. 29 January 2008.

Municipality of Pylkönmäki 2007. Pylkönposti 1/2007. http://www.pylkonmaki.fi/uploads/files/Pylkonposti_1_2007.pdf. 20 January 2007.

Neste Oil 2007. Suurimmat osakkeenomistajat. http://www.nesteoil.fi/default.asp?path=35,52,107,392,3021. 29 January 2008.

Private Communications

Teijonsalo, J 2008. Partner, ICECAPITAL Pankkiiriliike Oy. Several occasions in March 2008.

Appendix A – Summary tables

Jyllinkosken Sähkö	PV of cash	PV of delta cost to date	PV of future delta cost	PV of dividends to date	PV of future dividends	**Net gain**	Selling proceeds	Total electricity consumption[1]	Share of household consumption
			€ thousand				€ thousand	GWh	%
Ilmajoki	25 055	3 981	6 422	0	10 402	14 653	11 054	133	30 %
Kauhajoki	7 172	3 582	5 494	0	9 076	-1 904	3 164	130	41 %
Kurikka	38 795	2 500	3 864	0	6 363	32 431	17 116	87	40 %
Närpiö	16 626	3 674	7 264	0	10 938	5 689	7 335	187	17 %
Total	**87 648**	**13 737**	**23 043**	**0**	**36 779**	**50 868**	**38 669**	**537**	
Average	**21 912**	**3 434**	**5 761**	**0**	**9 195**	**12 717**	**9 667**	**134**	**32 %**

Lapuan Sähkö	PV of cash	PV of delta cost to date	PV of future delta cost	PV of dividends to date	PV of future dividends	**Net gain**	Selling proceeds	Total electricity consumption[1]	Share of household consumption
			€ thousand				€ thousand	GWh	%
Lapua	10 293	4 117	12 971	0	17 088	-6 796	4 541	127	29 %
Nurmo[2]	4 613	2 166	6 994	0	9 160	-4 547	2 035	64	56 %
Total	**14 905**	**6 283**	**19 965**	**0**	**26 248**	**-11 343**	**6 576**	**191**	
Average	**7 453**	**3 142**	**9 983**	**0**	**13 124**	**-5 671**	**3 288**	**95**	**43 %**

Hämeen Sähkö	PV of cash	PV of delta cost to date	PV of future delta cost	PV of dividends to date	PV of future dividends	**Net gain**	Selling proceeds	Total electricity consumption[1]	Share of household consumption
			€ thousand				€ thousand	GWh	%
Forssa[2]	2 669	1 815	7 504	0	9 320	-6 651	1 177	134	44 %
Hattula	12 580	754	3 626	0	4 380	8 200	5 550	0	59 %
Hämeenlinna	28 591	13 048	40 064	0	53 112	-24 521	12 614	605	21 %
Janakkala	18 298	7 489	21 941	0	29 430	-11 131	8 073	309	19 %
Kangasala	26 685	2 396	10 265	0	12 661	14 024	11 773	173	54 %
Kuhmoinen	10 712	341	1 667	0	2 008	8 704	4 726	28	63 %
Lammi	17 917	480	2 449	0	2 929	14 988	7 905	44	47 %
Padasjoki	12 199	592	2 319	0	2 911	9 288	5 382	38	64 %
Toijala	8 501	1 513	5 032	0	6 545	1 957	3 751	75	37 %
Urjala	14 105	840	3 526	0	4 365	9 740	6 223	57	46 %
Total	**152 257**	**29 268**	**98 392**	**0**	**127 660**	**24 597**	**67 174**	**1 463**	
Average	**15 226**	**2 927**	**9 839**	**0**	**12 766**	**2 460**	**6 717**	**146**	**45 %**

Revon Sähkö	PV of cash	PV of delta cost to date	PV of future delta cost	PV of dividends to date	PV of future dividends	**Net gain**	Selling proceeds	Total electricity consumption[1]	Share of household consumption
	€ thousand						€ thousand	GWh	%
Alavieska	1 216	269	1 210	525	2 183	-966	681	19	46 %
Haapajärvi	21 890	521	2 993	9 447	16 180	5 710	12 261	74	37 %
Haapavesi	20 431	307	2 414	8 818	14 543	5 888	11 444	84	32 %
Hailuoto	3 892	140	633	1 680	3 026	866	2 180	10	49 %
Kalajoki	24 565	709	3 997	10 602	18 920	5 645	13 759	100	35 %
Kärsämäki	8 026	37	609	3 464	5 290	2 737	4 496	40	22 %
Merijärvi	5 837	155	740	2 519	4 272	1 565	3 270	11	51 %
Nivala	28 700	298	3 177	12 387	20 083	8 618	16 075	134	27 %
Oulainen	19 458	527	3 232	8 398	15 018	4 440	10 899	82	39 %
Pattijoki	5 594	707	2 970	2 414	6 914	-1 320	3 133	36	70 %
Piippola	5 351	114	605	2 309	3 815	1 536	2 997	9	47 %
Pulkkila	6 567	0	410	2 834	4 210	2 357	3 678	24	26 %
Pyhäjoki	11 431	413	1 818	4 934	8 846	2 586	6 403	26	55 %
Pyhäjärvi	21 160	-679	43	9 132	11 608	9 552	11 852	145	17 %
Raahe[2]	7 053	2 168	9 834	3 044	16 083	-9 030	3 951	137	60 %
Rantsila	9 007	203	1 020	4 094	6 712	2 296	5 045	18	42 %
Reisjärvi	10 459	255	1 242	4 514	7 549	2 909	5 858	23	37 %
Ruukki	17 998	400	2 113	7 768	12 927	5 072	10 081	50	34 %
Siikajoki	4 378	217	974	1 889	3 724	654	2 452	13	48 %
Vihanni	9 242	167	1 221	3 989	6 736	2 507	5 177	38	30 %
Total	**242 258**	**6 928**	**41 254**	**104 760**	**188 638**	**53 620**	**135 692**	**1 071**	
Average	**12 113**	**346**	**2 063**	**5 238**	**9 432**	**2 681**	**6 785**	**54**	**40 %**

Keski-Suomen Valo	PV of cash	PV of delta cost to date	PV of future delta cost	PV of dividends to date	PV of future dividends	**Net gain**	Selling proceeds	Total electricity consumption[1]	Share of household consumption
	€ thousand						€ thousand	GWh	%
Jyväskylän mlk	39 446	-278	268	5 502	18 546	15 407	23 622	262	55 %
Jämsä[2]	33 819	-363	-982	4 716	15 897	14 551	20 253	112	60 %
Jämsänkoski[2]	11 283	-156	-356	1 572	5 299	4 924	6 757	56	63 %
Kannonkoski	8 246	-57	-122	1 148	3 871	3 406	4 938	14	49 %
Karstula	20 065	-69	3	2 800	9 437	7 894	12 016	45	44 %
Kinnula	7 562	-69	-187	1 056	3 558	3 204	4 528	15	53 %
Kivijärvi	8 098	-63	-185	1 129	3 807	3 409	4 849	13	63 %
Korpilahti	685	-128	-412	94	318	812	410	42	60 %
Kyyjärvi	6 996	-44	-66	975	3 288	2 843	4 190	13	45 %
Laukaa	11 283	-237	83	1 572	5 299	4 566	6 757	157	48 %
Muurame	1 429	-68	25	200	673	599	856	74	58 %
Perho	9 169	-90	-189	1 278	4 308	3 862	5 491	22	45 %
Petäjävesi	16 731	-64	-70	2 333	7 864	6 669	10 019	31	50 %
Pihtipudas	19 827	-170	-320	2 765	9 321	8 231	11 873	51	39 %
Pylkönmäki	7 711	-24	-58	1 074	3 619	3 100	4 617	6	69 %
Saarijärvi	31 080	-266	-359	4 336	14 617	12 752	18 612	82	52 %
Soini	12 325	-32	112	1 721	5 800	4 725	7 381	28	34 %
Suolahti	2 828	-78	-109	393	1 325	1 298	1 694	34	52 %
Uurainen	9 973	-88	-227	1 392	4 692	4 204	5 972	23	62 %
Viitasaari	26 198	-140	45	3 652	12 312	10 328	15 689	80	40 %
Ähtäri	5 627	-134	-88	786	2 649	2 413	3 369	66	46 %
Äänekoski	7 324	-252	-578	1 021	3 442	3 691	4 386	91	63 %
Total	**297 705**	**-2 868**	**-3 770**	**41 515**	**139 943**	**122 886**	**178 279**	**1 319**	
Average	**13 532**	**-130**	**-171**	**1 887**	**6 361**	**5 586**	**8 104**	**60**	**52 %**

Kainuun Sähkö	PV of cash	PV of delta cost to date	PV of future delta cost	PV of dividends to date	PV of future dividends	**Net gain**	Selling proceeds	Total electricity consumption[1]	Share of household consumption
			€ thousand				€ thousand	GWh	%
Hyrynsalmi	5 931	503	3 227	2 367	6 994	-7 160	3 106	25	54 %
Kestilän kunta	3 342	255	1 643	668	3 124	-2 349	2 475	13	44 %
Kuhmon	19 993	1 732	11 069	3 996	18 692	-15 496	14 809	99	39 %
Paltamo	5 348	710	4 544	2 134	6 306	-8 347	2 801	39	46 %
Puolanka	4 910	589	3 777	1 960	5 790	-7 205	2 571	29	54 %
Ristijärvi	5 007	239	1 537	1 998	5 904	-4 672	2 622	12	57 %
Suomussalmi	3 161	1 493	9 551	632	2 955	-11 470	2 341	78	50 %
Vaalan kunta	7 725	707	4 553	1 544	7 223	-6 301	5 722	35	51 %
Vuolijoki	3 646	418	2 649	1 455	4 299	-5 175	1 909	27	38 %
Total	**59 063**	**6 647**	**42 550**	**16 753**	**61 287**	**-68 175**	**38 358**	**359**	
Average	**6 563**	**739**	**4 728**	**1 861**	**6 810**	**-7 575**	**4 262**	**40**	**48 %**

Municipalities that are included in the analysis are listed in the tables. Other owners are not listed.
[1]Estimate of the 2007 consumption
[2]Industrial consumption excluded

Appendix B – Simulated prices

Table 16. Simulated price (€/MWh) according to national average benchmark

Jyllinkosken Sähkö	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Households	42.44	42.44	44.17	47.04	47.39	47.11	47.95	48.27	49.46	49.58
Agriculture	39.58	39.58	41.41	43.96	44.67	44.49	45.01	45.26	46.02	46.07
Services	31.65	31.65	29.67	32.22	33.08	32.79	33.01	32.93	33.37	33.05
Industry	23.10	23.10	21.95	23.91	23.90	23.75	24.09	24.32	24.72	24.72

	2005	2006	2007
Households	49.08	49.42	50.36
Agriculture	45.54	45.87	46.34
Services	32.46	32.26	30.07
Industry	24.14	24.13	21.91

Lapuan Sähkö	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Households	40.00	40.00	41.63	44.34	44.67	44.40	45.19	45.50	46.61	46.73
Agriculture	37.66	37.66	39.40	41.83	42.50	42.33	42.83	43.06	43.78	43.84
Services	29.55	29.55	27.70	30.07	30.88	30.61	30.82	30.74	31.15	30.85
Industry	22.18	22.18	21.07	22.95	22.95	22.80	23.13	23.35	23.74	23.73

	2005	2006	2007
Households	46.26	46.58	47.46
Agriculture	43.33	43.64	44.09
Services	30.30	30.11	28.07
Industry	23.18	23.17	21.03

Hämeen Sähkö	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Households	41.48	41.48	43.17	45.98	46.32	46.04	46.86	47.18	48.34	48.46
Agriculture	39.82	39.82	41.66	44.23	44.94	44.76	45.28	45.53	46.29	46.35
Services	32.88	32.88	30.82	33.46	34.36	34.05	34.29	34.20	34.66	34.33
Industry	22.32	22.32	21.21	23.10	23.09	22.95	23.28	23.50	23.89	23.88

	2005	2006	2007
Households	47.97	48.30	49.22
Agriculture	45.81	46.14	46.62
Services	33.71	33.50	31.23
Industry	23.33	23.31	21.17

Revon Sähkö	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Households	44.59	44.59	44.32	45.11	45.42	46.53	46.64	46.18	46.49	47.38
Agriculture	44.32	44.32	44.15	44.66	44.91	45.66	45.72	45.18	45.51	45.98
Services	36.80	36.80	36.48	36.73	36.64	37.13	36.77	36.12	35.89	33.45
Industry	28.49	28.49	28.31	28.72	28.99	29.47	29.46	28.77	28.76	26.11

Keski-Suomen Valo	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Households	49.22	49.16	49.16	50.03	50.37	51.60	51.73	51.21	51.56	52.55
Agriculture	48.42	48.34	48.34	48.90	49.17	49.99	50.05	49.47	49.83	50.35
Services	36.31	36.25	36.25	36.50	36.41	36.90	36.54	35.89	35.67	33.25
Industry	25.18	25.12	25.12	25.49	25.73	26.15	26.14	25.54	25.53	23.17

Kainuun Sähkö	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Households	46.70	46.63	47.98	47.98	48.77	49.96	50.09	49.59	49.93	50.88
Agriculture	47.80	48.04	49.42	49.42	49.85	50.68	50.75	50.16	50.52	51.04
Services	33.86	33.45	34.49	34.49	35.07	35.54	35.20	34.57	34.36	32.03
Industry	26.18	26.18	26.82	26.82	27.79	28.24	28.23	27.58	27.57	25.02

Simulated figures represent case utilities' electricity distribution prices under municipal ownership

Appendix C – Sensitivity analysis and parameters

Table 17. Alternative discount rates used in sensitivity analysis

Discount rate alternative	1996	1997	1998	1999	2000	2001
Yield of 5-year government bond	6.03 %	4.86 %	4.30 %	4.07 %	5.27 %	4.54 %
EMA cost of equity	9.26 %	8.13 %	6.96 %	6.92 %	7.67 %	7.22 %
Flat 7.5%	7.50 %	7.50 %	7.50 %	7.50 %	7.50 %	7.50 %

Discount rate alternative	2002	2003	2004	2005	2006	2007
Yield of 5-year government bond	4.41 %	3.28 %	3.25 %	2.85 %	3.59 %	4.18 %
EMA cost of equity	7.16 %	6.31 %	6.28 %	6.43 %	5.96 %	6.47 %
Flat 7.5%	7.50 %	7.50 %	7.50 %	7.50 %	7.50 %	7.50 %

EMA cost of equity is the base case discount rate
Yield of 5-year government bond from Bank of Finland (2008)

Table 18. Annual price changes of benchmarks used in sensitivity analysis

Benchmark	1996	1997	1998	1999	2000	2001
National average						
Households	0.00 %	4.09 %	6.49 %	0.74 %	-0.59 %	1.77 %
Agriculture	0.00 %	4.63 %	6.17 %	1.60 %	-0.39 %	1.17 %
Services	0.00 %	-6.27 %	8.58 %	2.67 %	-0.87 %	0.69 %
Industry	0.00 %	-4.99 %	8.92 %	-0.03 %	-0.63 %	1.46 %

	2002	2003	2004	2005	2006	2007
National average						
Households	0.68 %	2.45 %	0.25 %	-1.00 %	0.68 %	1.90 %
Agriculture	0.55 %	1.67 %	0.13 %	-1.16 %	0.72 %	1.04 %
Services	-0.27 %	1.34 %	-0.96 %	-1.79 %	-0.62 %	-6.79 %
Industry	0.96 %	1.64 %	-0.04 %	-2.32 %	-0.05 %	-9.22 %

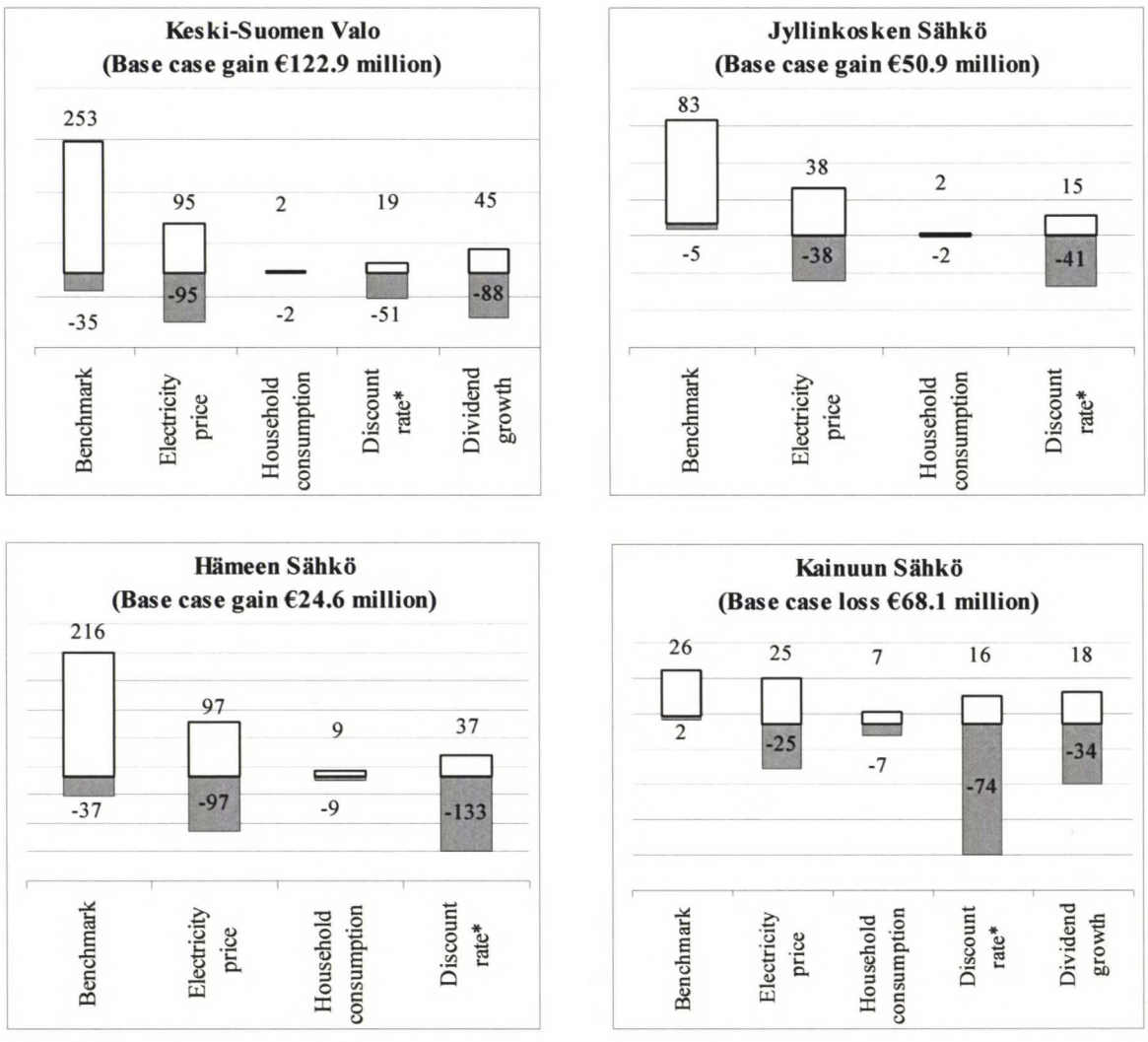
Benchmark	1996	1997	1998	1999	2000	2001
Suur-Savon Sähkö						
Households	0.00 %	4.09 %	6.49 %	0.00 %	0.00 %	5.95 %
Agriculture	0.00 %	4.63 %	6.17 %	0.00 %	0.00 %	6.83 %
Services	0.00 %	-6.27 %	8.58 %	0.00 %	0.00 %	6.41 %
Industry	0.00 %	-4.99 %	8.92 %	0.00 %	0.00 %	7.26 %

	2002	2003	2004	2005	2006	2007
Suur-Savon Sähkö						
Households	3.56 %	1.00 %	3.73 %	0.00 %	4.12 %	-0.01 %
Agriculture	3.34 %	1.06 %	3.10 %	0.00 %	4.27 %	-0.01 %
Services	3.33 %	0.76 %	2.93 %	0.00 %	5.93 %	-7.60 %
Industry	4.23 %	0.96 %	2.96 %	0.00 %	2.31 %	-9.90 %

Benchmark	1996	1997	1998	1999	2000	2001
Keravan Energia						
Households	0.00 %	4.09 %	6.49 %	0.00 %	-0.26 %	0.00 %
Agriculture	0.00 %	4.63 %	6.17 %	0.00 %	0.00 %	0.00 %
Services	0.00 %	-6.27 %	8.58 %	0.00 %	-0.50 %	0.00 %
Industry	0.00 %	-4.99 %	8.92 %	0.00 %	0.00 %	0.00 %

	2002	2003	2004	2005	2006	2007
Keravan Energia						
Households	0.03 %	1.46 %	-1.01 %	0.11 %	0.00 %	-0.01 %
Agriculture	0.03 %	1.68 %	1.30 %	10.74 %	0.00 %	-0.01 %
Services	0.00 %	0.65 %	0.00 %	0.00 %	0.00 %	-7.92 %
Industry	0.00 %	0.97 %	0.00 %	0.00 %	0.00 %	-12.32 %

Figure 17. Sensitivity of net gain to certain parameters



Bars represent deviations from the base case net gain when the sensitivity analysis scenarios are applied.
Figures are in millions.
*Used only in discounting delta cost and selling proceeds as the underlying assumption is that the municipally co-owned utilities are non-dividend paying.

Appendix D – Return on regulatory asset base

Regulatory asset base which is used as the basis for allowed return is calculated as the net present value of the electricity distribution network:

$$NPV = \left(1 - \frac{averageage}{lifetime}\right) \cdot RV \qquad (6)$$

where

NPV = Net present value of the component group

RV = Replacement value of all of the network components in the component group. The replacement value denotes the cost that would be incurred when constructing the network components of the component group in question at current cost levels.

lifetime = The lifetime denotes the period for which a network component is actually in operation before it is replaced (the techno-economic lifetime).

average age = The average age denotes the average value of the age data of the network components in the component group weighted by their replacement values. The average age is defined as an average value for individual network components.

The net present value is adjusted annually according to following equation:

$$NPV_{2008,i} = (PPA \cdot NPV\%_{2007,i}) + INV_{2007,i} - DEPR_{2008,i} \qquad (7)$$

where

$NPV_{2008,i}$= component i's net present value in 2008

$PPA_{2008,i}$= purchase price of component i with cost level of 2008

$NKA\%_{2007,i}$= proportion of component i's net present value to its purchase price in 2007

$INV_{2007,i}$= investment in component i in 2007 measured with 2008 cost level

$SLD_{2008,i}$= straight line depreciation of purchase price of component i at start date of the review period (1 January 2008)

The weighted average cost of capital used in assessing the reasonableness of pricing is estimated as follows:

$$WACC = C_E \cdot \frac{E}{D+E} + C_D \cdot (1-t) \cdot \frac{D}{D+E} \qquad (8)$$

where

WACC = Weighted average cost of capital

C_E = *Cost of equity*

C_D = *Cost of interest-bearing debts*

t = Rate of corporation tax during the period under review

D = Amount of interest-bearing debts

E = Amount of equity